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The Farmer's Digest

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The Farmer's Digest

Volume 14 November, 1950 Number 7

Farming—The Greatest of Professions

Condensed from The Rural New-Yorker

Louis Bromfield

For a generation or more a quiet revolution has been taking place almost unnoticed in American agriculture. Indeed, two revolutions have been taking place, the one affecting the other—one away from the frontier, and the other a revolution brought about by the almost incredible advances, discoveries and developments made within the wide fields of agriculture and animal husbandry. Both have served to alter and raise the level of American agriculture far above anything known in the past in this country or elsewhere. But the most important result, perhaps, has been the fact that the farmer is no longer a man who simply subdued wild virgin land, and then plowed, fitted and reaped for a succession of years. The good farmer has become very definitely a professional like the lawyer, the engineer and the doctor. The only difference is that the good farmer today must know more about more things than any man in any other profession. He must be part business man, part specialist, part veterinarian, part agronomist, part mechanic, part chemist, part meteorologist and part a great many other things besides, since no profession covers so broad a field or reaches into so many compartments of science and even the universe as agriculture. This is indeed a long way from the pioneer who, armed perhaps only with a rifle, a team, a plow and a harrow, set out to subdue the land and then raise upon it virtually everything needed for the food and even the clothing of his family.

In the period between the first pioner and the modern professional farmer, the country developed in a fashion and with a rapidity unheard of before in the history of the world. At the same time an industrial and mechanical

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revolution took place with incredible speed, and railroads, trucks and even airplanes opened up remote areas and brought manufactured clothing, machinery and even processed foods to the farmer while they took his products to distant cities sometimes as far as three or four thousand miles to deliver them fresh and edible in a completely diflerent climate.

Let us look at some of these distances. Cities in the Southwest, the Deep South and along the Gulf of Mexico today import on an average 40 to 50 per cent of their milk every day from as far away as Minnesota and Wisconsin. Oranges and avocados and grapefruit travel from the Rio Grande, Florida and California to the remote States of the North and even overseas. Fresh vegetables are eaten on the tables of New York that were raised two thousand to four thousand miles away. The technological advances made in quick freezing and processing have annihilated the seasons and even many a farmer today is eating last year's fresh beans and peas out of his quick freeze up to the time he harvests the new crop of the following year.

Today most successful farmers live in the country exactly as their brothers live in a city house or apartment, save that the farmer has the much greater advantages of complete independence, space, fresh air, beauty, and a freedom which no city dweller ever knows.

These are truly staggering changes which have taken place within the lifetime of many of us. In other countries and in other times similar changes and advances have occurred only in terms, not of generations, but of centuries. Such a remarkable revolution has required countless adjustments and countless revisions in the economy and agricultural philosophy of our times. It has confused many of our farmers just as it has confused many of our economists, our bankers and our politicians. Only the most intelligent of farmers with the most flexible of minds have been able to keep pace and make the adjustments of the greatest advantage to himself and consequently to the nation as a whole.

Since the time of Abel, the first Biblical farmer, there have been good farmers and bad ones. There have, as in other professions, been the shiftless and the ignorant as well as the intelligent and the hard-working. The pioneer was not necessarily a good farmer. Very often he had no farming experience whatever but was merely an adventurous or a desperate fellow seeking to improve his condition by going into a new country on free land. Such a breed produces good farmers only by accident, and that largely was the record of our frontier agriculture

and indeed of our agriculture on the whole until very recently. It is true that in some areas the soils were so deep and so fertile that it was impossible to damage them very much during a long period even of generations, but once that period came to an end and the farmer needed to be a real and a good farmer in order to survive, the prosperity of that farmer went rapidly downhill if he failed to fill the conditions. Any of us, driving across country anywhere in the United States, can read the record in the once handsome houses and barns, built out of the richness of the original virgin soil, which today are unpainted and often rotting away because the descendants of the lucky farmer who took up that free rich virgin land were not farmers or husbandmen at all but merely exploiters of what they inherited, destroying their own prosperity and their capital at the same time.

Other pioneers, less fortunate, claimed less deep and rich soils and they came to the end of the road much more rapidly as erosion ate away their soils and depletion rapidly lowered yields.

The pioneer farmer and even his successors were not altogether to blame. As I pointed out, many of them had had no agricultural experience whatever and unless a man went out and worked to dig up the information—a process frequently impossible in remote areas, he had no way of learning even the most primitive rules of a sound agriculture.

During the Agricultural Revolution of the past generation or two, all of that has changed. The Federal Government and the State Colleges are spending in excess of two billion dollars a year to help the farmer in an immense variety of ways from parity guaranties, price supports and subsidies to agricultural colleges, the extension service, vocational agriculture courses, pamphlets, loans and in a hundred other ways. No element of our society today has so much government money spent to help it. I am merely trying to make a point of the enormous difference between the situation of the farmer today as compared to that of the pioneer farmer or even the farmer of the Nineteenth Century.

One eventual consequence of the Agricultural Revolution will be the gradual economic liquidation of the inefficient farmer unless he chooses to hang on, living at an abysmally low standard of living in the primitive fashion of the old frontiersman. This will come about despite the subsidies, price supports and parity guaranties which are serving today to subsidize and maintain the outer poor fringe of agriculture and land use. Behind this assertion lies the principle that a good farmer underwrites his own security by high production per acre of ex-

cellent crops and forage and by efficient and well-managed operation. A farmer practising an agriculture based upon such an operation will comfortably survive in times of panic and in times of good prices will become a rich man. He will never be forced to submit to government regimentation and will be able perpetually to maintain that rugged independence and liberty which is, of all the farmer's rewards, perhaps the greatest.

Such an agriculture will, generally speaking, never be established or maintained in this or any other country, mankind being what it is, but we can move toward such a goal as far as possible and in the last generation or less we have been moving rapidly in that direction. Today we already can study the operation of farms by a younger generation who have had the vast opportunities for knowledge made available to them. They have benefited by the 4-H clubs, the Future Farmers of America, vocational agriculture classes and agricultural college educations, and their approach to agriculture is as remote as possible from that of the earlier exploiting farmers. Many of them have been compelled willingly, to adopt a new approach because there is no longer any free land available. The young people have been forced, in getting started, to take over half-ruined land left over from an earlier and poorer agriculture. These young people might well be called New Pioneers who are doing a job on a New Frontier which is the wrecked land left behind by the first Pioneers and their descendants. I have seen thousands of these young people from one end of the United States to the other and my opinion is that in intelligence, education and agricultural wisdom they are far in advance of their pioneer ancestors and in terms of courage, hardiness and industry certainly their equals.

The very pattern of agriculture today is different from that of the Nineteenth Century. The old pattern of the general farm with a few milk cows, a few beef cattle, a few sheep and hogs and a few chickens, together with ten acres of this and ten acres of that is becoming obsolete by the force of economics and of changing times. It is a pattern which in the frontier wilderness was a necessity but that necessity has long since passed with the arrival of the railroad, the truck, the airplane, the telephone, mechanization, technological changes, radio market reports and countless other factors.

The old "general-farm" pattern requires long work hours spent very often in puttering about doing a little of this and a little of that. It cannot afford complete mechanization because in so scattered a program too much varied and

expensive machinery is required. It means a lowered efficiency in every one of the projects undertaken and consequently a lowered income and longer working hours.

There is no longer any necessity for the farmer to be self-sufficient. He is no longer cut off from markets or distribution. One only has to observe in any community today that the most prosperous farmers are those who are part businessman, part scientist and part specialist. Their specialties may be grass farming, or dairying, or potatoes, or seed stock or a score of other things. They are prosperous because they concentrate upon doing at most two or three jobs well rather than a dozen in a halfway fashion. They are prosperous because they are *modern* farmers living in the Twentieth Century rather than in the Eighteenth or Nineteenth.

I am by no means an advocate of great industrialized farms and I regard the family-sized farm as one of the greatest bulwarks of our economy and the stability of our society. The question is not one of the size of the farm but of the land use and working program of a particular farm. A farmer with 50,000 acres may be as poor as Job's turkey or one with 50 acres may show a net profit of many thousands of dollars a year. It is a question of program and of use of the land in a modern economic civilization from which the Indian, the wildcat and the Indian trail have disappeared, to be replaced by the tractor, the truck, the market report and the lightning transportation of the airplane.

Of course, the one fundamental which has remained unchanged and is eternal is the farmer's soil. His use of it and its productivity determines his prosperity and even his human dignity, for a prosperous and successful farmer is always a more respected and dignified and important man than his unsuccessful and backward neighbor. Each day his importance to our society and to the stability of our economy becomes more evident, and more and more this fact is being recognized among bankers and industrialists.

Concerning our knowledge of soil, we have advanced more in the past generation than in the whole history of the world before. We know today how to maintain good soils and even to create out of inferior soils or worn-out ones, land which is as good or better than most good virgin land. It is up to the individual himself. There is less excuse than ever before for bad agriculture or a bad farmer, or indeed even for an unsuccessful one. Successful farming has become one of the greatest if not the greatest and most important of all professions.

Soil Fertility for Sale

Condensed from The Southern Planter

Malcolm H. McVickar
Chief Agronomist, National Fertilizer Association

A FARMER has just one thing to sell—soil fertility. Every-time he markets his products, he is, in a very real sense, offering consumers some of his precious soil minerals.

Livestock farming does not rob soils of these minerals as fast as a cash grain system. For one thing, animal manure, if properly cared for, returns to the soil plant food which would have left the farm had the crop gone off to the market. Also, under a system of livestock farming, a large section of the land is usually in grasses and legumes—our best soil-conserving crops.

But even livestock farming is soil depleting, unless there is provision for a judicious use of lime and fertilizer. The farmer who pays no attention to soil fertility is heading for trouble. His profits, if any, will decline and his animals will become poorer with the soil itself.

Let's look at the fertilizer in 2 tons of forage, about the average amount consumed by a cow during the grazing season. This quantity of forage (on a dry basis) contains about 125 pounds nitrogen, 35 pounds phosphoric acid and 100 pounds potash. If the manure is returned and conserved, losses will not be as great; nevertheless a heavy drain is inevitable.

The plant-food content of the forage is more than equivalent to that contained in 500 pounds of 20 per cent nitrogen fertilizer, 125 pounds of 20 per cent super-phosphate and 160 pounds of muriate of potash.

Likewise, each pound of meat draws plant food from the soil. The sale of a 1,000-pound beef animal represents a loss of the amount of phosphoric acid contained in 80 pounds of 20 per cent super-phosphate and a proportionate loss of other nutrients. Positive steps can be taken to remedy this situation.

Legumes, once properly inoculated and vigorous in growth, will go a long way to offset the nitrogen loss. To supplement the nitrogen and to correct the rather large phosphorus and potash removal, it is essential to apply fertilizers. Otherwise, fewer blades of grass will grow and those remaining

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will be smaller or of an entirely different type—low in minerals and food value.

Good livestock farmers have learned to appreciate the value of commercial fertilizers. They know that through their use it is possible to graze more cows per acre and to increase profits. What's more, good pasture means healthy livestock—animals on poor lands are plagued by numerous nutritional disturbances.

Fertilized pastures start off earlier in the spring and furnish grazing later in the season, reducing the period of expensive barn feeding. This is only half of the story. Not only will more grass grow but the nutritional value of the herbage will be increased in two ways: (1) High fertility favors the growth of clovers and palatable grasses rich in minerals and protein; (2) fertilizers may affect the quality of the forage by changing the nutritive value of the growing plants. Within limits, the more plant food there is in the soil, the more the plant will absorb.

The effects of fertilizer on the kinds of plants predominating in pastures are well demonstrated by an experiment conducted by the Virginia Agricultural Experiment Station. For this test a field was selected which contained approximately 75 per cent broomsedge. One portion was fertilized with the equivalent of 600 pounds of 8-8-8 fertilizer per acre; another received no treatment and was left as a check plot. The treatments, begun in 1939 were repeated each spring through 1943, and the pasture was grazed closely each year.

In the spring of 1944 counts showed that bluegrass and white clover had almost completely crowded out the broomsedge on the fertilized area, leaving only 8 per cent of the treated area still covered with this pest. On the untreated section, however, no decrease in the broomsedge had taken place.

Pasture improvement is one of the cornerstones of the livestock industry. Data collected a few years ago by the U. S. Department of Agriculture showed that each 100 pounds of digestible nutrients obtained from pasture cost 64 cents; from alfalfa hay, 83 cents; from corn, $1.38; from corn silage, $1.54; and from oats, $2.02. Although these are not today's prices, the relationship remains about the same.

Such figures show that grassland farming offers the farmer a golden opportunity. More feed per acre can be produced in the form of grass than in any other crop. Furthermore, this feed comes from the most economical source, since the cow does the harvesting, except when the crop is put up for hay or silage.

There is no crop on which fertilizer pays better than pastures. Let's look at the facts.

For each ton of commercial fertilizer used on pastures for beef cattle, the farmer receives an extra 1,000 pounds of beef, or, in the case of the dairy farmer, an additional 8,000 pounds of milk. At today's prices—in fact at prices prevailing throughout the course of our history—the returns from such an investment are most favorable. Currently, the return is about $7.00 for $1.00.

In much of the South, year-round grazing is possible if the farmer uses the right crops and applies liberal amounts of fertilizer. Those who practice such grazing usually rely on fall crops to furnish pasture until about November when winter grazing crops should be available.

Some of the most desirable and successful early winter grazing crops are combinations of small grains and annual legumes such as winter oats and crimson clover. These crops are seeded during the late summer or early fall so that good growth is obtained before cool weather sets in. This period is the critical time in the program and the success of winter grazing is dependent on obtaining good growth of the crops before mid-November. Good stands and good growth can usually be assured by selection of adapted varieties and by use of rather large amounts of fertilizer. As much as 800 to 1,000 pounds of some such fertilizer as 2-12-12 pays off handsomely.

Rotational grazing is a necessity since the livestock must be removed during mild days so that the plants can accumulate some reserves. Grass-legume combinations will usually furnish grazing from November to April when permanent pastures are available.

Specific fertilizer recommendations for pastures can be obtained from county agents, or soil samples can be taken and submitted to the state agricultural college for testing. However, most agricultural workers fairly well agree as to the amounts and kinds of fertilizer to use. In establishing new seeding, it generally pays to use some such analysis as 4-12-4, 3-12-6 or 5-10-5 at a rate of 500 to 1,000 pounds per acre. This fertilizer should be drilled or worked well into the seedbed before or at the time of seeding. It manure is used liberally, the grades recommended include 0-14-7 or 0-20-0.

Once the pasture is established, additional plant food is required to maintain the stand and a fertilizer like 0-14-7, 0-12-12 is commonly used at the annual rate of 200 to 500 pounds per acre. The higher amounts are absolutely necessary to maintain productive pasture crops such as Ladino clover. This fertilizer can be applied with a grain drill or as a broadcast top-dressing in either fall or early spring with equally good success.

Tomorrow's Pure Bred Business

Condensed from Guernsey Breeders' Journal

Professor E. J. Perry
Rutgers University

PURE breds have been a big factor in the high position now occupied by the dairy industry of this country. The leaders in production improvement projects have usually been breeders of pure breds. Their enthusiasm for superior stock has acted as a leaven in the building of interest in better, healthier cattle in all areas of our land. It is a far cry from the churn test of a century or less ago to our present Herd Test. A "bull proof" was unthought of in 1875. If the pioneer breeders of yesteryear could return to us they would be gladdened by the many instances of 4-H and FFA boys founding pure bred herds from one or two choice females.

With gratitude for such achievements, we must nevertheless admit that a big challenge still faces the dairy breeding fraternity. Despite many excellent producing herds, the average yearly yield of all of our milk cows is only approximately 4850 pounds of milk and 200 pounds of butter fat, and thousands of herds of pure breds and grades of all breeds are still below the average of 275 pounds of butter fat. The questions which the most astute of those pioneer breeders would ask if they could visit us, would probably include some like these: "Has the registered dairy cattle business yet reached the point where the term 'pure bred' denotes distinction?" "Do most dairymen praise pure breds as a whole?" "Are pure bred herds culled as rigidly as other herds?" "Can the present program for the development of the registered dairy cattle business be improved in any way, and can more interest be created in pure breds not only among owners of grades, but also among some of those who now have registered herds, but who are making little or no headway?" The following suggestions are presented with the hope that they may stimulate some discussion on this subject:

1. Every national breed association should publish a small attractive booklet by some such title as "Candid Advice to the New Breeder." It should contain words of caution and set forth in easily understood terms the practical

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steps that should be followed. Such a booklet from national headquarters, together with suggestions from experienced breeders, field-man or extension agent, would have considerable weight. A field-man of one of the national breed associations recently said, "Advice not to plunge leads too many wealthy starters to think the adviser doesn't know his stuff. Some of these men want to do almost at once what more experienced breeders have taken a lifetime to accomplish. They won't ask the first adviser any more questions, but off they go and hire a man who will help them to spend a lot of money. 'The more you spend the more you make' is too often untrue." A successful breeder is an asset to the breed association; he who is unsuccessful is a liability. The fact that a herd is pure bred is far from a guarantee that it will pay for all of the extra costs involved in a big setup.

2. Place much emphasis on culling and selection. Economy of production is the touchstone of dairy success. The manager of a pure bred herd recently remarked, "The cows in the end of the stable are not producing well, but their bloodline is popular now." Many thousands of the most profitable herds of today, both pure breds and grades, owe their good average yearly production largely to a program of rigid culling. Every unprofitable pure bred is of concern to the breed association in which it is registered. Whenever selection is relaxed, the cattle population returns to its original condition. The principles of selection apply equally to a herd or a breed. In only one generation, it cannot have much effect on variability of the population. This is why we must rely mainly on the long-time breeders for the development of herds that are pure bred for production and type, as well as for genealogy. Discovering the undesirable characters and then getting rid of them is a major task.

3. Herd and breed improvement would be rendered easier if each breed association would have one and the same system of proving bulls. Liberal prices have been paid lately for certain bulls on the strength of the favorable data in a D. H. I. A. proof (U. S. D. A.). A little later the yield figures based on official records of other daughters have reflected discredit on some of the same bulls. The effect is little short of a panic, especially if the deals for the bulls were closed by a cooperative breeding association's selection committee which is answerable to hundreds or perhaps thousands of dairymen. Sometimes the first progeny report available is that based on official Herd Test records. In either case, the effect is the same when the results are at considerable variance. Two of the breed

associations now send their Herd Test records to the U. S. Bureau of Dairy Industry where they can be used along with D. H. I. A. records to constitute as much data as possible for sire appraisal. All records are corrected to the two-time milking, 10 months lactation, mature equivalent basis. More breeders are also beginning to think that one system of production testing, with the accuracy of records properly safeguarded, would greatly simplify the proving of bulls and the interpretation of other data pertaining to herd and breed improvement.

4. Refuse to register progeny of cows that do not make creditable records. This should instantly inspire more confidence in pure breds among the rank and file of dairymen everywhere. Having a minimum standard of yield, which would have to be reached before a cow could be fully registered, would give to pure breds a distinction not previously enjoyed. If a registered pure bred cow does not have a commendable production record, she should be considered actually worth less than a good yielding grade.

5. Breeders should always practice the principles of the Golden Rule with fellow breeders. The breeder least likely to succeed is he who thinks that the chief object in owning pure breds is to sell bulls at top prices and dispose of culls at more than the price of good grades. Today the power of advertising is tremendous. Some dairymen buy breeding stock much more judiciously than others. In some instances, the man who is looking for a great herd sire has a herd with an appreciably higher average yield than that of the cow family from whence came the bull that is being considered for purchase. If the prospective seller knows this fact, he will help the breed and his fellow breeder by refusing the sale, and he will also be enhancing his own reputation. Knowing the yearly herd average of the prospective bull buyer would enable the breeder to offer helpful suggestions to that individual.

6. Help more young dairymen to get established with good pure breds. The support which the breed associations have given to the 4-H and FFA organizations during the past 25 years has been deserving of warmest praise. In looking ahead, only two or three suggestions occur in this connection. There should be more special work with older youth—with recently married young dairy farmers and their wives, because they are usually in dead earnest about the economy of production and the building of capital assets. If they are convinced that the gradual building of a herd of registered stock will help them to have a satisfactory rural life, both they and the pure bred industry will be

benefited. The writer has been acquainted with a goodly number of breeders who began to win success with their pure breds just on the eve of retirement. They have said in substance, "My biggest mistake consisted in failing to have this kind of herd 25 years ago." One of the best ways for an established breeder to boost his breed and help the coming generation, is (1) never to sell for breeding purposes any animal he would not wish to keep for himself, and (2) follow up the stock that is sold to young people. Nothing pleases a new club member more than to have the breeder visit or even phone him and continue to show an interest in the progress of the animal. Ofttimes the young purchaser will give more weight to advice and suggestions from him than from anyone else.

7. We must be sensible about type. A breeder can use no better slogan than the well-known "Production is paramount, type is essential." Type should add to the market value of a dairy animal mainly as it relates to production and longevity. Levelness of rump has helped to bring an increased price for many a cow, but there is no proof that such a rump has helped the cow or her production. Just about all species of wild and domestic animals have sloping rumps. The beautiful deer of the forest is a "sloper." We have all been educated to like a cow's rump that is perfectly level. Today some breeders think a rump that slopes to some extent might be the preferable kind because it would permit better drainage of the vaginal tract. Here again more evidence is needed. Obviously a broad rump is desirable because it is usually accompanied by good width between pin bones and it goes along with good body capacity.

The best breeders and judges are logically laying major stress on dairy character capacity, udder condition and development, and strong feet and legs. There is no correlation between production and certain minor points on the score card, such as levelness of rump, width and dish of face, length of neck, etc. However, figures do show that production and type do tend to go together in the cow population represented in the classification system. This is because the inspectors and judges are laying most emphasis on the above points that mean the most, namely, dairy quality, udder development, and body capacity. In one breed association which has been doing classifying for a number of years, a recent tabulation showed that the average production for the cows classifying Poor, was 431 pounds of butter fat, and the average for those with an Excellent rating was 601 pounds of butter fat. The yield

for those classifying Very Good and Good Plus was similar, being 554 and 544 pounds of butter fat, respectively. The man who takes an interest in the type of his cows is usually a better dairyman than one who doesn't—a natural expectation.

For 30 years the writer has been privileged to work part of the time with owners of registered stock of all dairy breeds, and also with those having grades. He believes more good herds of pure breds should be kept when they are properly handled because they do afford a good way to build capital assets, and to obtain some additional income annually from the sale of a few head of quality foundation animals. Such income sometimes spells the difference between profit and loss in a year of poor crops or low milk prices. In addition, the best pure breds average appreciably higher in production than the best grades and it doesn't cost any more to raise them. Few achievements can be more laudable than helping to create great cattle for the benefit of future generations of American dairymen. Some changes in the policies and regulations pertaining to the pure bred business are certain to come in the future as in the past. Let us make sure that those changes continue to be constructive, so that more good young dairymen will be challenged to enter the business because of the soundness of the program.

Rye Helps Him Hit High Hog Market

Balbo Rye is great pasture for early spring pigs. R. H. Hunt says it cheapens his costs, saves extra pigs and helps him hit a high fall market.

He moves cots to the field and farrows 20 litters on rye. By March 15, the crop starts to green in Vermilion county, Illinois, and sows get the high-vitamin roughage needed to make them milk well.

Pigs are shifted, May 1, to a mixture of alfalfa, timothy, ladino and lespedeza, which supplies them succulent, high-protein grazing until they are finished. Rye is plowed down and the ground is planted to cannery sweet corn, which is off in time to get rye into the ground by early September.

Hunt took his cue from Illinois Experiment Station, where tests have shown that rye pasture saves both pigs and feed. Sows on rye save bigger litters, feed them well, and give them a push that keeps them ahead of pigs started in dry lot.

—Cappers Farmer

Changes in Farming

Condensed from Farm Research

J. L. McGurk
Cornell University

SIGNIFICANT changes have taken place in the physical and business organization of farms in New York State during the past 40 years. Farm-management surveys in Tompkins County provide some interesting figures which actually measure these changes.

The first successful farm business survey in the country was made in Tompkins County in 1908. This survey has been repeated every 10 years. The present report summarizes, for the town of Dryden, some of the more important changes that have taken place in farm receipts, expenses, and capital investment during the 40-year span from 1907 to 1947. The town of Dryden is east of the city of Ithaca, and is typical of much of the dairy farming region of central and southern New York State.

Receipts in 1907 amounted to $1,495 per farm, while in 1947 they averaged $12,722, or eight times as much as in 1907 (Table 1). In 1947 two-thirds of the receipts were from the sale of milk and its products, whereas only 44 per cent were obtained from this source in 1907. When the value of dairy cattle sold is added to milk receipts, 76 per cent of the 1947 receipts came from the dairy cattle enterprise, as compared with 51 per cent in 1907. These figures indicate that farming in the town

Table 1—Receipts per farm, 1907 and 1947, for farms in town of Dryden, Tompkins County, New York.

Items	Amount		Per cent of total	
	1907	1947	1907	1947
Milk	$655	$8,312	44	65
Eggs	107	570	7	4
Dairy cattle sold	107	1,347	7	11
Sheep and wool	30	5	2	0*
Other livestock	54	149	4	1
Vegetables	202	655	13	5
Other crops	219	69	15	1
Increase inventory	78	1,396	5	11
Miscellaneous receipts	43	219	3	2
Total	$1,495	$12,722	100	100

*Less than one-half of one per cent.

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Geneva, New York, July 1950

of Dryden has become more specialized with increased emphasis on dairy cattle and milk production.

Expenses, like receipts, have increased (Table 2). In 1907 expenses averaged $597 per farm, and in 1947 amounted to $9,248. Expenses increased 15 times during the four decades.

Table 2—Expenses per farm, 1907 and 1947, for farms in town of Dryden, Tompkins County, New York.

Items	Amount		Per cent of total	
	1907	1947	1907	1947
Grain	$159	$3,124	26	34
Labor*	224	1,545	37	17
Equipment .	46	1,780	8	19
Real estate†.	33	902	6	10
Livestock ...	46	839	8	9
Crop	45	505	8	5
Other	44	553	7	6
Total	$597	$9,248	100	100

* Includes unpaid labor.
† Does not include taxes for 1907.

The most important expense item in 1907 was for labor, which represented 37 per cent of the total expense, but in 1947 labor accounted for only 17 per cent. Purchased grain made up 34 per cent of the total expenses in 1947. It was also an important item in 1907, but a relatively smaller proportion of the total, 26 per cent.

Capital invested on the average farm in the town of Dryden increased from $6,365 in 1907 to $23,141 in 1947 (Table 3). Thus the capital investment on these farms, in terms of dollars, was 264 per cent greater in 1947.

In 1907 three-fourths of the total investment was in real estate and 17 per cent was in livestock. By 1947, however, only 45 per cent of the investment was in real estate and the investment in livestock had risen to 37 per cent. The amount invested in equipment in 1907 represented 7 per cent of the total investment as compared with 17 per cent four decades later.

Table 3—Capital investment per farm, 1907 and 1947, for town of Dryden, Tompkins County, New York.

Items	Amount		Per cent of total	
	1907	1947	1907	1947
Real estate	$4,624	$10,459	73	45
Livestock	1,096	8,402	17	37
Equipment	436	3,998	7	17
Feed and supplies	209	282	3	1
Total	$6,365	$23,141	100	100

Labor income per farm in the town of Dryden averaged $580 in 1907 and $2,317 in 1947, a difference of $1,737 (Table 4).

Table 4—Financial summary, 1907 and 1947, for farms in town of Dryden, Tompkins County, New York.

Item	1907	1947
Receipts	$1,495	$12,722
Expenses	597	9,248
Farm income*	898	3,474
Interest, 5 per cent ..	318	1,157
Labor income	$ 580	$ 2,317

* Return to investment and operator's time.

About 60 per cent of this difference must be attributed to the

higher general price level in 1947. The remainder of the difference in labor incomes was apparently due to such factors as increased size of business, specialization, mechanization, and improved farming practices.

In 1907 the total farm expenses were only 10 per cent of the capital invested in the farm business. In 1947 expenses were 40 per cent of the capital. At the 1907 ratio it would take 10 years for expenses to equal investment on the average farm. At the 1947 ratio it would take only 2½ years for expenses to equal investment.

If a farmer were in debt for 100 per cent of his investment in 1907 his expenses would be increased by 48 per cent as a result of the interest payment. If the 1947 farmer had been in debt for all of his capital the interest charge would have increased the total expenses by only 13 per cent. Expenses other than interest have increased so much and have become such a fixed part of the farm business operation that interest payments have declined in relative importance as a part of the farm expense.

Farming has always been a gamble. The stakes are much higher now than they were 40 years ago. The high expenses associated with modern farming make it possible for a farmer to lose his farm in a short time if he is unsuccessful because of low prices, bad weather or poor management. The high receipts associated with modern farming make it possible for a farmer to pay for a farm in a short time if good management is combined with favorable prices and weather.

"Goodbye Mr. Woodchuck"

Condensed from American Agriculturist

Dynamite

For the last two seasons we have used dynamite with excellent results. We usually use a one-half pound stick of 40% dynamite with about three feet of fuse attached. We then place it down in the hole which is plugged.

—*F. A. Salisbury, Phelps, N. Y.*

Poison

If you want to get rid of woodchucks, mix one part of paris green with ten parts of salt and put the mixture in the hole. Lead arsenate will do instead of paris green. By using a long-handled spoon, or something similar, you can get the dope far enough down the hole so

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Ithaca, N. Y., August 5, 1950

that stock cannot get it. I have tried almost everything and this mixture beats them all.—*Martin J. Keough, Aurora-on-Cayuga, N. Y.*

Gasoline

Take an ordinary burlap bag and cut it into four pieces. Soak each piece in gasoline and poke one piece into every den while the gasoline is still dripping from the piece of burlap. Poke it in as far as possible and then seal the entrance. This kills the chuck inside, and no outsiders use the hole again because of the odor which remains for quite awhile.

I treated two fields that way last year, and so far this year there have been no woodchucks on them.—*Albert T. Kardas, Valley Falls, N. Y.*

A Real Woodchuck Dog

When I bought the farm it was so badly infested with woodchucks that it was really dangerous to walk in the meadows where there were so many holes. Finally I got a Shepherd pup and when he was a year old I went with him to locate the holes. The first year he killed 5 woodchucks. Then every year he increased his find until one year he brought 100 to the door.

Two years ago, at the age of 17, he started to lose his hearing and eyesight so I got another Shepherd pup. Together they located the holes and the new dog, like the old one, makes his rounds every day. So far, he has killed 2 this year. I never had anything destroyed by them. We never allowed the dogs off the farm to hunt.

This year the old dog died at the age of nearly 20 years, and the young one is carrying on his good work. So far, he is true to his job along with being a good cow dog, so I can truthfully say a good Shepherd dog is worth his weight in gold.—*Stoddard Porter, Ellenville, New York.*

Fire

You ask for advice on getting rid of woodchucks. This is easy. All you need is a pointed shovel, a quantity of old rags, preferably wool (an old sock is fine), a can of gasoline and some matches.

First, plug all entrances to the hole except one; next, have a shovelfull of dirt or sod handy; saturate the rag with the gasoline; push it well into the hole; light your match and throw it in the hole. There will be a flash, so be sure to keep out of range. Plug the hole thoroughly and forget it. The slowly burning rags will hold the gas and smoke for some time. I never have known this to fail. I never have had any luck with bombs. Try it, but be careful!—*H. S. Fullagar, Penn Yan, New York.*

Five Pigs To Break Even

Condensed from The American Hampshire Herdsman

Gerald C. Anderson
University of Missouri College of Agriculture

A sow must raise at least five pigs to pay her way!

Profits from the swine enterprise may be largely determined by the care and feeding that a brood sow receives before and after she farrows. Carelessness and a lack of attention to important practices will usually result in a high death rate in the litter and accordingly small litters weaned. With poor feeding and care the chances of a sow returning a profit are small. The following suggestions have been tested and will help improve pork production.

The quarters provided for the sow at farrowing time should be reasonably warm, dry, free of drafts, and easy to clean. Such pens should be prepared several days before the sow is due to farrow. Guard rails offer the baby pig a great deal of protection and will prevent a considerable loss of pigs from overlaying by the sow. They are commonly placed about eight to ten inches from all walls and about eight inches from the floor. In addition, it is often advisable to section one or two corners of a pen with 2″ × 4″s to provide a space for a brooder and a creep for the pigs.

Before the sow is placed in the farrowing pen the walls and floor should be thoroughly scrubbed with a solution of one pound of lye in thirty gallons of boiling hot water. This removes any hardened filth and does a great deal towards killing parasite eggs and harmful germs that may await the young pig. After scrubbing the pen with hot lye water a complete spraying or scrubbing with a reliable disinfectant such as a good coal tar dip should follow.

The sow should be removed from the rest of the herd three or four days before she is due to farrow. This gives her time to become acquainted with her new surroundings. Accordingly she will be less restless and more easily handled at farrowing time.

Before placing the sow in the farrowing quarters, her sides, underline, feet and legs should be thoroughly washed with soap and warm water to remove dirt and filth in which worm eggs may be present. This simple precaution will help prevent the pigs from becoming infested with parasites

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Peoria, Illinois, March 1950

early in life, the effects of which cannot later be overcome with worm treatments.

The amount of bedding given to the sow should be moderate—a light covering on the floor will suffice. Often the tendency is to be too liberal with the bedding, when actually such a practice is dangerous. With large amounts of bedding available a sow tends to work it into one large pile. This may serve as a trap for the small pig, holding him out of sight until his mother unwittingly squeezes him to death. The pig often finds his dinner plate out of reach, perched atop a stack of straw! Experience has shown that enough bedding to keep the pen dry is best. The kind of bedding used is not so important as long as it dry and fine.

Keeping a pen dry requires some attention, but usually the regular removal of soiled, damp bedding and replacement of it with clean, dry material will do the job. Dryness, next to warmth is a must for the survival of a newly born pig.

Since for some time after birth the pig is unable to keep himself warm if the temperature is below approximately 40° F., a source of artificial heat must be supplied. If this is not done the small pig will become chilled, lose his desire to nurse, become weak and die. Also, when small pigs become cold they pile up, often times over the warm spot left by the sow, or near to their mothers, and as a consequence many pigs are overlaid.

A simple brooder will supply an economical source of warmth and will be a big asset in raising large litters. A brooder should be roomy and should not produce too much heat, i.e. about 65° to 70°. With the more elaborate brooders the temperature may be easily regulated by adjusting the thermostat, while with other brooders a raising or lowering of the heat bulb will serve as an adjustment. All good brooders should have a source of light at all times to attract the pigs. Usually by the time the pigs are three to four weeks old, depending of course on weather conditions, the brooder may be removed.

It is highly important that the ration of the sow be carefully regulated in the days immediately prior to farrowing. The amount of feed should usually be reduced and care should be taken to supply a ration which is mildly laxative. Large amounts of feed, especially a heavy concentrated ration, tends to stimulate milk flow before the pigs have arrived. Overfeeding may result in congested and inflamed udders. For easiest farrowing and for a rapid recovery a sow's digestive tract should not be loaded with waste material. A good way to accomplish these objectives is to cut the regular grain ration in half and make the other half (by measure) wheat bran. Such bulky feeds as oats or wheat shorts may also

be used. Of course some sows will demand more feed than others to keep them satisfied and quiet, but usually one quart of the half bran, half regular ration mixture fed twice daily will be adequate during the three or four days before the pigs are due.

Many pigs may be saved if someone is present when the sow is farrowing. This is especially true if the weather is severe or the sow is experiencing difficulty. The presence of an attendant at this time often means the difference between success and failure. Most important of all is to be sure that each pig gets free of the membranes that surround it at birth and that the nose and mouth are cleared of fluid so that breathing is not blocked. Each pig should be helped to a good feeding of the first milk. This is especially important if the pigs are small and weak.

Soon after birth the naval should be thoroughly disinfected. A tincture of iodine solution is suitable. This practice will prevent an infection from becoming established and will do much in keeping the pigs healthy and well-doing. A small bottle with a wide mouth may be used. Place the cord in the bottle and hold it against the pig's belly for a minute or so. If the cord is long it should be clipped off about six inches from the body before being disinfected.

The small sharp needle, or wolf teeth should be clipped soon after birth. The teeth should be cut off evenly so that no rough edges or pieces will be left. Care should be exercised so as not to injure the gum. The pig has no use for these teeth and if they are not removed they may interfere with his suckling, and will often injure the sow's udder leaving an open pathway for infection.

As a means of identification, each pig should be ear marked and his number recorded. Later, this identification is valuable in selecting gilts for replacement purposes. In all cases care should be taken in locating the marks, and they should be put in so as to be clear and easily read.

During the first twenty-four hours following farrowing the sow will usually not need any feed, but should have all the water she desires. If, however, she is restless at feeding time it may be wise to offer her a small amount of whole oats or similar bulky ground feed fed as a thin slop. The promptness of the sow's recovery from farrowing and the success with which she comes into milk will largely depend upon her feeding during the first week. She should receive a bulky laxative ration. A ration similar to that fed prior to farrowing with the inclusion of bran as suggested is satisfactory. Beginning with the second day following farrowing the sow may be fed about one double handful of feed at each feeding (about one half pound).

By the fourth day this may be increased to twice this amount, or one pound, and on the sixth day to one and a half pounds at each feeding. Beginning with the second week the ration should be increased at the rate of one half to one pound daily until the sow is on full feed. During this time the amount of bran may be gradually reduced. Of course, each sow is an individual and therefore is different. Accordingly, the herdsman who knows each sow well can regulate her feed to the best advantage during these early weeks after farrowing. Common sense must always be used.

Too much haste in bringing the sow to full feed may over stimulate milk flow. Ordinarily the pigs are best able to use large amounts of milk after they are two to three weeks old. In many instances, if the sow is brought up to her full milk producing capacity before this time the pigs will develop scours. Usually this digestive disturbance results in a loss of appetite and often a setback in the growth of the pigs. As a result the sow's udder may become congested and inflamed and prevent her from producing a maximum amount of milk later on when the pigs can use it to best advantage.

Since pigs are born with very little iron and copper in their bodies and sow's milk is low in these two minerals which are necessary for the prevention of anemia, the suckling pig must have his milk supplemented with these minerals if he is to thrive. One may accomplish this by painting the sow's udder twice daily with a solution of iron and copper. A mixture commonly used is made up of five ounces of iron sulfate and one ounce of copper sulfate dissolved in one quart of water. One may also accomplish this purpose by placing small amounts of clean earth in the corner of the pen. The earth should be taken from an area where hogs have not been for at least three years in order to avoid contaminating the pigs with parasite eggs. Sometimes the iron and copper solution is sprinkled lightly over the earth. In any case one should begin using one of these methods at least by the time the pigs are a week old and should continue to do so until the sow and pigs are placed on pasture, or the pigs are eating considerable amounts of the creep ration.

After the pigs are three to four weeks old they will begin to eat small amounts of solid feed. A good doing litter is not usually able to get enough milk from the sow during the last three weeks or so of the suckling period to grow at the maximum rate, even though the sow is a good milk producer and is well fed. Under most systems of sow and litter management a creep should be provided for the pigs. The creep ration should be

highly nutritious since the pig will consume only small amounts of feed. A supplement made up of tankage 2 parts, soybean oil meal 1 part, and alfalfa meal 1 part, self fed with whole shelled corn is suggested as a creep ration for pigs in dry lot. If the pigs are on lush green pasture, the alfalfa meal may be left out. If skim milk or other good quality dairy by-product is available, it may be fed along with whole shelled corn or similar grain with good results.

The best time to castrate and vaccinate the pigs is a subject about which there is considerable argument. Both should be done before the pigs are weaned, but not at the same time. The author prefers to castrate not later than two weeks of age and then vaccinate after the wounds have healed, usually between the fifth and sixth weeks so that the pigs will have recovered and be doing well before they are weaned at eight weeks.

Some Suitable Rations for Brood Sows Suckling Pigs

Feed	Dry Lot			Pasture		
	A	B	C	A	B	C
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Corn or other grain	73	68	54	90	73	63
Oats	..	..	25	..	..	25
Wheat Shorts	..	10	..	..	20	..
Tankage, Meat Scraps or Fish Meal	5	5	5	10	5	5
Soybean Oil Meal	5	..	4	..	..	5
Alfalfa Meal or other Legume	10	15	10	..	..	..
Ground Limestone	1	1	1	1	1	1
Salt	1	1	1	1	1	1

Chopped Hay Was Best

Windrow chopped alfalfa put more and cheaper pounds on steers than alfalfa harvested in other ways, according to tests at Colorado A and M College. Steers fed chopped hay in a ration with grain made higher gains than those fed alfalfa as silage, dehydrated pellets, baled or loose hay. Lots fed stacked alfalfa hay made the lowest daily gains.

—Cappers Farmer

Farm Woodland Cooperative

Condensed from Pennsylvania Farmer

Annette H. Richards

One of the most puzzling problems facing a farmer is what to do with his woodlot. If his forest acres amount to only five or ten, he is apt to leave them alone, for most sawmill operators will not bother with such "chicken feed." Or, if they do, they charge a higher price than for larger lots, claiming that the overhead is higher. At any rate, they tend to be careless and wasteful and give the woods a "rough time" as well as reaping most of the profits.

In Chester county, Pennsylvania, however, 62 small woodland owners representing some 4,000 forest acres in a 25-mile radius of Downingtown, have done something concrete about this. And, after four years of dreams and two and one-half years' operation, their cooperative sawmill has more business than it can handle. Its assets total a round $40,000, its output a million board feet annually, and the profit reported at the third annual meeting in June, 1949, was about $6,000.

Woodland Products, Inc., has not had easy sledding though. It started on a shoestring in early 1945 when Paul L. Coates, prominent dairyman, interested the Pomona #3 Grange in the idea of a woodlot cooperative. At the same time, J. Howard Mendenhall, an energetic young forester, graduate of the Pennsylvania State College Forest School, was fired with a similar idea.

After the war, farmers had a backlog of construction to be done and cost could be cut considerably by using their own logs. Following an early meeting Mendenhall was asked to draw up several alternative plans for possible cooperative efforts in the area. He drew up three.

Farmers could pool their wood products and market them through a central agency on a commission basis to sawmills, furniture plants, etc. This would entail no investment in equipment.

Secondly, they could own and operate a portable sawmill that would speed logging on small woodlots.

Thirdly, they could set up a permanent sawmill and operate it for their own benefit, marketing

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their logs, doing the badly-needed custom sawing, and encourage woodlot owners to practice conservation methods to improve their forests. This combination of management, processing and marketing would enable them to have the benefits of large-scale mechanized equipment for logging operations and long-term woodlot planning.

This last suggestion received a green light. Soon officers were elected. A tentative name, Chester-Delaware Woodland Owners Co-op Association, was adopted.

Charter members put up the money to buy a two-man, gasoline-powered chain saw and to hire men to begin cuttings. Fred Coates, was engaged to run the mill because of previous sawmill experience.

Not until all this had taken place did they apply for a charter. They found that under existing laws they would have to organize as a corporation with cooperative by-laws. The charter was granted in November, 1946, under the briefer name, Woodland Products, Inc. The charter gave the corporation the right to ". . . manufacture, buy, sell and deal in, either for itself or as an agent for others, timber, lumber, millwork and other building materials of every kind and description, and in the development of woodlands and the resulting by-products of forests; and to engage in the buying and selling of machinery and equipment necessary and incidental to timbering, lumbering and millwork and to perform any and all things necessary and incidental to such business."

With the charter in its pocket, Woodland Products, Inc., bought an 8½-acre lot of gently sloping ground near Dowingtown. It borders hard-surfaced Boot Road on one side and the main line of the Pennsylvania Railroad on the other and is within easy access to power lines. A second-hand sawmill was set up and a truck was purchased.

The first logs were cut in April, 1947, but together with temporary shut-downs and training of green workers, only two months operation were reported at the first annual meeting held in August. The books were in the red. But farmers' demand was beginning to be met and the future looked promising. Up until this time the mill had been operating in the open. Now a concrete block structure $42 \times 140 \times 14$ feet with aluminum sheet roof was authorized to be built. Upkeep on this type of structure is practically eliminated and it is fire resistant.

Assets included a truck, a chain saw, a caterpiller tractor, a 56-inch saw with a 30-foot carriage and five 52-inch head blocks, a cut-off saw, a slab elevator and edger, all electrically-powered,

plus various other tools necessary for sawmill operation.

The co-op issued 1,250 shares of common stock and an equal number of shares of preferred stock at $10 per share. Each member must purchase one share of common stock for every ten acres of woodlands that he owns. Many buy preferred stock in addition.

In return for membership, a member enjoys many advantages. The co-op engages a reliable contractor to do the cutting, skidding and hauling of the logs if the farmer wishes this service. Trees are marked by the co-op's forester, Sam Jones, who has an eye toward sustaining the woodlot's yield, weeding and improving the stand. According to the owner's specifications, the mill does custom sawing at a charge of $20 per thousand board feet payable in cash or in logs. Trees standing in a co-op member's woodlot are paid for in cash equivalent to 95 per cent of current prices, the remaining 5 per cent payable in common stock or in cash for amounts under $10. Products of the co-op mill are marketed to members and others while a continuous search is made for new markets. Even sawdust and slabwood are disposed of.

One requisite for members is that they practice conservation on their woodlots. The co-op hopes that it will become standard practice for woodlot owners to reinvest something of the profit realized in every cutting in woodlot improvement.

Profits are disposed of in this order: Preferred stockholders receive up to 4 per cent interest on their investment. Common stockholders then receive up to 4 percent. Remaining funds are divided among members who have done business within the year in proportion with the volume of that business. This is called patronage refund and it encourages members to do business with Woodland Products, Inc.

Woodland Products, Inc., lumber has gone into construction of the Pennsylvania Turnpike extension and into loading corrals at the King Ranch in Chester county. Innumerable farm buildings ranging from barns to hog houses and fences have cropped up to the satisfaction of every one concerned.

One church benefited considerably by its use of the sawmill. It obtained the lumber for its Sunday School addition from its own land and from that of its members and friends. By donating 25,000 board feet of lumber and using their own manpower for cutting, skidding and hauling, the church saved $2,000.

Although custom sawing comprised half of the first year's work, it has caught up with the demand to the extent that it now accounts for a little over one-fourth. This does not mean that the amount of custom sawing has decreased, but

rather that the total volume of business has increased.

The co-op hopes that it has attained a one million board feet annual production level that will keep it in business and farmers supplied indefinitely. Located in the middle of an estimated 110,000 forest acres in Delaware and in Chester and Delaware counties in Pennsylvania, this seems more than wishful thinking.

Mr. Mendenhall says that one or two cooperatives modeled along similar lines, but adjusted to local conditions, could operate to the advantage of every timber-producing county in the United States.

Don't Let Wool Fool You

Condensed from The Michigan Farmer

E. D. Farwell, MSC

SHEEP judging is rather difficult because the judge must be able to see through the fleece. He must confirm what he sees with his eyes by going over each individual lamb or ewe with his hands. Sheep are produced for both meat and wool so it is also necessary to consider the fleece in judging.

Finish is by far the most important factor in placing fat lambs, although type and quality are important and many times may be the deciding difference when finish between two lambs is very close. Fat lamb judging is much like fat steer judging as the carcasses are cut in about the same way, although the lamb carcass is much smaller. It is not easy to feel for finish on lambs as the beginner frequently mistakes the covering wool for fat. Lambs do not have a heavy, firm finish like steers and a small difference may mean a great difference in the carcass.

Lambs should be well finished over the back and loin and also should be well covered with fat down over the ribs. They should be thickly fleshed over the rump and full and deep in the twist. A heavy covering of finish over the point of the shoulder is also a good indication of a fat lamb.

Type or conformation in lambs is the same as for steers. They should be deep-bodied and short-coupled. The top lambs will be low set or short-legged and they will be wide from end to end. The leg is the most valuable cut in the lamb carcass and must be deep, plump, and wide. Lambs should also have balance. Many lambs lack balance because they are light in the leg.

Quality in lambs is shown by

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East Lansing, Michigan, August 5, 1950

uniformity, style, and firmness. Packers like lambs that are trim about their middles and firm in their fleshing. Lambs should be uniform in width and depth and should be smoothly covered.

The judging of breeding classes of sheep is complicated because of the large number of breeds. This discussion will be limited to the judging of the medium wool or mutton breeds such as the Southdown, Shropshire, Hampshire, Oxford Down, Suffolk, Cheviot, Dorset and Corriedale. The fine wool breeds are judged with the same points except that more emphasis is placed on the value of their fleece. The long wool breeds, Lincolns and Cotswolds are judged on the same points as the medium wool breeds although their fleece is used for different purposes.

Breeding classes are judged on type, quality, breed and sex character, feet and legs, natural fleshing and fleece. Type has already been discussed and is the same as for the fat classes. However, it becomes the most important reason for placing the breeding classes. Look for thick, deep-bodied, short-coupled ewes or rams that are heavy in their legs.

Quality has also been mentioned but should again be stressed. Ewes should be trim-middled, compact in the shoulders, uniform in width down the top and refined about the head and neck. Look for stylish sheep that hold their heads up and that have a bright clear fleece.

Ewes of all breeds should be feminine and refined. Rams should be rugged with strong masculine heads.

Feet and legs are often overlooked. Many ewes are knock-kneed. Judges look for straight legs that are set squarely under the body. The pasterns should be straight and strong.

Some judges and breeders place little emphasis on the fleece while others think it is very important. Fleeces are judged on the basis of length of staple, fineness, and density. There is a great variation between the fleeces of the different breeds. Black fibers are very objectionable, especially if found on the body. The fleece should be clean and free from burrs and chaff. It should be uniform over the various parts of the body and also even in the distribution of yolk. The skin should be a bright pink color.

Hothouse Lambs

Condensed from New Jersey Farm and Garden

W. C. Skelley

IN THE North Atlantic area of the United States where great populations are centralized and various nationalities are represented, a demand has developed for a young lamb which is known as a "hothouse" or "early" lamb. The demand is greatest at Christmas and at Easter, as these are feast times for certain groups of people in the United States.

What is a hothouse or early lamb? It's a lamb that is marketed while still carrying its baby-fat and is milk-fed, as it is still nursing its mother when sold. These lambs run from 30 to 60 pounds in live weight, although 40- to 45-pound lambs generally are most desirable. These lambs may be from 6 to 12 weeks of age.

Hothouse lamb production is a very specialized branch of sheep production and greater care and thought will have to be given to assure a successful program.

In starting a flock for the production of these baby-fat lambs, the breeder must remember that the gestation period of a ewe is five months. She normally comes in heat when the cool fall nights begin and continues to come in heat every 16 to 21 days thereafter until conception takes place or until spring when the heat cycle goes into a rest period during the summer months.

To overcome the condition just mentioned, we have a breed of sheep in the United States that will breed out of season—the Dorset-Horn. This characteristic is dominant so that when Dorset-Horn rams are crossed with ewes of other breeds the characteristic is still retained in the offspring. The cross that is used most to produce ewes for this type of lamb production is Dorset-Horn rams bred to Merino or Rambouillet ewes. The ewe lambs from this mating are retained and bred to Hampshire, Southdown, or Shropshire rams to obtain the market lamb.

This Dorset-Merino or Rambouillet crossbred ewe makes an excellent mother with a high milk flow, and she produces a high grade fleece of wool, shearing eight to ten pounds. If the producer does not want to take the time to breed up a ewe flock, these crossbred ewes can be purchased, since large numbers are produced in the

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Sea Isle City, New Jersey, August 1950

Merino section of Western Pennsylvania and Eastern Ohio. Even though these ewes do breed out of season, before turning the ram in with them they should be flushed or, in other words, put on a high scale of nutrition.

This is accomplished by turning them out on lush pasture, high in its percentage of legumes, or by adding grain to the ration. This should be done two weeks before and continued through the breeding season. The breast of the ram should be smeared with a coloring material such as lamp black and oil, or Venetian red and oil, so that the owner can check to see that the ewes are being bred. The color should be changed every 16 days so that a check can be made to see if the ewes are coming in heat the second time.

In caring for the flock during the winter months, the building housing the flock does not need to be elaborate, but it should be dry overhead and underfoot and free from drafts. Bedding should be sufficient to supply a comfortable floor.

Feed for the flock during the winter months should be mostly roughage, consisting of leguminous hay and silage, either grass or corn; or if root crops are available, such as mangels, beets, turnips, parsnips, or carrots, they can replace the silage. This feeding can be followed until about three weeks before lambing time when about one-half to a pound of grain should be added to induce the milk flow. This grain ration can be made of two parts cracked corn or ground barley, two parts of oats, and one part of bran.

Before lambing, pens should be provided so the ewe ready to lamb can be separated from the flock and watched during this period. If allowed to run with the flock the lamb may get separated from the mother and become chilled and, of course, lost. After 96 hours the ewe and lamb can return to the flock.

When the lamb is about two weeks of age, it will begin to take an interest in food, and a small enclosure called a creep should be provided to allow the lambs to eat by themselves. Grain and hay should be provided—leguminous hay such as clover or alfalfa, and grain mixture of three parts cracked corn and two parts rolled or crushed oats. This feed, together with their mother's milk, will push them to their greatest gains so that a quality product goes to market.

The last point of the program is the marketing of the product. This is done in one or two ways. First, on the hoof direct to private customers. Second, to commission firms in the large cities. Where the latter method is followed the lambs are generally slaughtered and sent to market hog-dressed. That is, they are carefully bled,

the viscera are removed, care being taken not to disturb the kidneys or the fat around them, the hind legs being cut at the ankle joint and bound together. The front legs are removed at the ankle joint and fastened back by means of wooden skewers. The pelt is left on and they are shipped to market in iced barrels. Lambs that are well-fleshed bring a premium at the seasons mentioned.

This branch of the sheep industry can be profitable to Eastern farmers as a side line, provided they are equipped and are willing to give time to an enterprise of this kind.

Data on Inbred Carcasses

Condensed from The Ohio Farmer

TOP CARCASS quality can be bred into beef cattle! This was demonstrated in an experiment recently completed at the Ohio Agricultural Experiment Station. Feeder cattle produced by inbreeding superior lines of Herefords were finished out in the station feed lots. The finished carcasses rated higher, on the average, than those of the unselected feedlot cattle of the check lots.

Paul Gerlaugh, who is in charge of this beef research, now has the final figures for the five lots of cattle. The three inbred lots of feeders came from the U. S. Range Livestock Experiment Station at Miles City, Montana. They were produced in a closed herd where no outside bloodlines had been brought in for 15 years.

All three of the inbred lots were sired by inbred bulls with good performance records in the Miles City bull testing program. The first two lots were from related dams while the dams of the third lot were unrelated to the bulls.

As a check against the performance of standard bred steers sold as feeders through midwestern markets, two lots of commercial cattle were bought on the open market at St. Paul and Kansas City. One group came from Montana and the other from New Mexico. All groups weighed around 750 pounds per head when the 175-day feeding test was started last winter.

The preliminary report stated that the inbred cattle showed superior gaining ability and more

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Cleveland, Ohio, August 5, 1950

economical production than the straight-run cattle. The same trend shows up in the completed test. Average daily gains of 2.33, 2.38 and 2.34 pounds were made by the inbred lots. The third lot had only inbred sires, not inbred sires and dams both as did the first two lots.

Contrast the above figures with 2.17 and 2.13, the daily gain figures for the two check lots of commercial cattle. The gains made by the check lots are respectable by most cattle feeding standards.

Average daily gains for the three inbred lots together were 9.5 per cent more than for the two check lots. Feed efficiency for the three inbred groups was 8.5 per cent over that of the standard cattle of the check lots.

All of the experimental cattle were sent to market through the Swift and Company yards in Cleveland. Here they were weighed individually, both before and after killing, to obtain the final live and dressed weights. L. E. Kunkle, in charge of meats research for the experiment station, and his helper, Robert Deans, followed the cattle right into the chill room at the Swift plant.

The beef halves were hung on the chill room racks and broken to expose the rib-eye or area of lean meat through the rib. Then Deans made a tracing of the rib surface and rib-eye on thin tracing paper. By this method he was able to compute the exact surface area of lean meat. This process eliminated much of the guesswork in rating carcass quality.

Kunkle filled out a score sheet for each beef carcass. The carcasses were numbered and Gerlaugh didn't let out the secret of which carcasses came from the inbred cattle until after the rating and scoring had been completed. After Kunkle had completed his ratings, Ray Walker, Swift's Columbus beefman, went through the chill room with Kunkle and checked the final ratings.

This commercial beefman's opinion wasn't far from that of Prof. Kunkle. He moved a few of the ratings down a notch, such as from "choice plus" to "choice," but he upped one for about every one he lowered.

Here's what they found in carcass grades. Two of the inbred lots had seven carcasses each which rated choice or better and the other lot had nine. Two inbred lots had one each and the other one had two carcasses which rated lower than choice. The two check lots each had six carcasses rated choice or better and each lot had four which rated below choice.

At first glance, dressing percentages did not look as good for the inbred as for the commercial cattle. The inbred groups ran a little over 60 and the check lots a little over 62. However the higher percentage of fat on the check lot ani-

mals may account for the higher dressing percentage.

These are the results of only one experiment but they seem to follow a definite trend. Already Ohio breed associations are thinking of ways to start record of performance tests. The next logical step is to intensify the desirable characteristics within the best bloodlines. Beef cattle will measure up if they're bred to high standards!

Good Farmers Make Good Soils

Whether cropland improves or runs down is mainly a matter of how the farmer—good or bad—manages it, according to Dr. B. T. Shaw of the U. S. Department of Agriculture. The idea of "virgin" soils being good agricultural soils is not always true, says Dr. Shaw, Deputy Administrator of the Agricultural Research Administration. In most cases virgin soil calls for a period of management to bring out and improve its productive possibilities.

Under cropping, Dr. Shaw told a New England audience recently, soils tend to approach a fairly stable level of productivity "which represents a balance between down-grade processes such as removal of nutrients and loss of organic matter, and upgrade processes such as gain in nutrients and organic matter from residues, manure, fertilizers, and rock weathering."

"With a cultivated crop like corn grown continuously without fertilizers or manure for long periods, the yield does not drop to zero but levels off at about 9 or 10 bushels to the acre," Dr. Shaw continued. "This is what has happened in many old countries with dense population and under-developed agriculturel. With annual additions of 5 tons of manure, the equivalent yield of contiuous corn is raised to about 30 bushels to the acre. When corn is grown in a rotation with clover and the land is limed so that clover will grow, the equilibrium yield is also about 30 bushels to the acre.

"When both lime and manure are used on the rotation, corn yields are raised to about 50 bushels per acre. When fertilizers are used also the equilibrium yield can be pushed still higher. Thousands of farmers have demonstrated that it is possible to produce rather consistently corn yields of 100 bushels per acre in all of the Corn Belt and in many other states."

—Better Crops

Are You Losing Money on Machinery?

Condensed from Successful Farming

Walter Wilcox

MODERN farm machinery is a profitable investment. But only when it is used close to its capacity. Excessive machinery investments are the result of buying too big a machine for a small job. Many jobs on the average family farm are too small to warrant investment in a modern machine to do them. The solution is to exchange machine work with a neighbor, or hire the job done on a custom basis.

Here, tool by tool, are some guides to help you judge when you need a machine, when you don't.

Tractors. One tractor should handle the average family farm with 60 to 100 acres of crops. A tractor on such a farm will be used 500 to 750 hours a year. Larger farms (up to 200 acres of crops) can be operated with one tractor. But a second tractor becomes a profitable investment when one has 1,000 hours of tractor work to perform. A low-cost way of getting belt power for running blowers and elevators at harvesting time is to buy an old tractor at a nominal price.

Land preparation and cultivating equipment. Each farmer should plan to own his own plow, disc, field cultivator (if needed), harrow, and corn cultivator. Except on the smallest farms, the plow should be a 2-bottom 14″ or 16″ plow. A 7′ tandom disc—or the equivalent in a straight disc—and a 4-section harrow, and a 2-row cultivator are recommended as standard minimum equipment.

Where quackgrass is a problem, a 7′ field cultivator should be a part of the standard equipment. Each piece of this equipment will only be used from 2 to 10 days a year on the average farm.

Fertilizer-grain drill. The farmers in most of the humid sections of the United States will increase their small-grain yields by the use of fertilizer at the time of seeding. Fertilizer applications at this time also increase the stands and yields of new grass and legume seedings.

Yet a fertilizer-grain drill costs from $500 to $750. We recommend a 13-7″ fertilizer-grain drill as an efficient machine for the family farm. But it will only be used 2 to 5 days a year on the average farm, with 20 to 50 acres

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of small grain. Find more work for it, if you can.

Through exchange with neighbors, the fertilizer-grain drill should be used to seed a minimum of 75 acres of small grain each year. By careful planning and cooperation, a 13-7″ fertilizer-grain drill is adequate for seeding 75 to 100 acres of small grain each year.

Two-row tractor corn planter. Old horse-drawn planters can be converted for tractor operation. But a new tractor planter with fertilizer attachment has many advantages. It is not such an expensive machine as a fertilizer-grain drill, and for this reason the cost will not be excessive for smaller acreages.

The average family farm has use for a corn planter only 2 to 4 days a year. One can put up with considerable inconvenience with the old planter rather than to make an investment of $250 to $300 to be used such a short time each year. But if you do not have and cannot get a fertilizer attachment for your old planter, it may pay you to buy a new tractor corn planter with fertilizer attachment.

To keep down per-acre planting costs, arrangements should be made to plant at least one neighbor's corn with the new planter. A 2-row tractor corn planter is adequate for planting 80 to 100 acres of corn.

Mower and side-delivery rake. You will want to have your own mower and side-delivery rake. Although these machines are used only 3 to 5 days a year on the average farm, they are used for such short periods at a time—often as little as 1 to 2 hours—that either exchange arrangements or custom hiring is impractical.

Field forage harvester. Small field forage harvesters are now available at a cost of around $1,700, including the blower. This machine can be used to harvest grass silage, dry hay, straw (following the combine), and corn silage. Used in this way, it will replace the hay loader, corn binder, and silage cutter.

For most efficient operation, each field forage harvester should have a string of two or three mechanical unloading wagons, and a wagon-unloading drive and power unit.

Our first reaction is that this equipment is too expensive for the family farm. But this machine will handle the hay, straw, and silage harvesting jobs on *three* family farms. If three farmers bought new, conventional machinery to harvest their hay and silage, they would have as large a total investment as if they jointly bought the forage harvester and mechanical unloading wagons.

Three farmers—if they can pool their investment or allow one farmer to own the equipment and do the work on a custom basis—can utilize this new labor-saving

machinery at no increase in cost over similar new conventional machinery—and at a saving of 8 to 15 days of labor on each of the three farms.

A critical consideration is the quality of the chopped hay vs. long hay. Chopping hay will not improve its quality, but neither will it decrease the quality if it is cut in relatively long lengths, after properly curing in the field.

Combine harvester. A 5-foot combine will harvest 30 to 50 acres of small grain in 3 to 5 days. This machine will cost around $1,600. It is too expensive to use only 3 to 5 days a year. But, in the usual season, small grain can be combined over a period of 10 to 15 days without risking harvesting losses. Each combine should be used on a minimum of 80 acres, and can be safely scheduled to harvest 100 acres a year. This means that the combine must be used on three to four farms each year to avoid excessive costs.

Cornpicker. The cornpicker, when fully utilized, saves more man labor than any of the other harvesting machines. You can pick 4 to 8 acres of corn a day with a single-row picker. Thus, the average farm with 30 to 50 acres of corn to be picked from the standing stalk has 5 to 8 days' work for a cornpicker. The cornpicking season normally lasts 15 to 21 days. Each single-row cornpicker should be scheduled to pick 75 to 90 acres of corn, to cut per-acre costs.

Hay baler. The hay baler is usually bought by farmers who expect to do custom work, in addition to baling their own hay. Small automatic pickup or field balers are now available at a cost of around $1,200. A small baler has a seasonal capacity of around 5,000 to 8,000 bales a year. The average farmer may have 2,000 to 2,500 bales of hay and straw to harvest each year. Thus even the smallest balers should be used on two to three farms, if you want to keep costs down.

In spite of its popularity, the hay baler is one of the least economical harvesting machines. Because the bales usually are handled by hand when hay is baled from the windrow, only half an hour of man labor is saved per ton over the usual loose-hay harvesting methods.

Other machines. Operators of larger farms may want to consider buying larger units of equipment or additional items. The same method of analysis should be used in considering the purchase of a weed sprayer, a mechanical dairy barn cleaner, an automatic silage unloader, and many other new units of equipment now available Do you have enough of a job for it to do on your farm to make it a profitable investment? If not, can you arrange with neighbors to fully utilize the machine?

You can afford modern machinery if you can fully utilize it. But excessive machinery costs result from buying too much machinery to do too small a job.

The annual cost of depreciation, repairs, interest on investment, and housing ranges from 10 to 15 percent of the purchase price for farm machinery. If you are considering buying a $1,000 machine, be sure you have $100 to $150 worth of work for it every year.

Estimated cost per hour of machine use*
(As related to hours of use annually)

General farm machinery				Tractors			
Hours of use per year	Cost of machine			Hours of use per year	Cost of machine		
	$200	$400	$600		$1,000	$1,500	$2,000
25	$.70	$1.40	$2.10	100	$.90	$1.35	$1.80
50	.36	.72	1.08	300	.33	.50	.66
100	.20	.40	.60	500	.25	.38	.50
200	.16	.32	.48	700	.23	.34	.46
300	.15	.30	.45	900	.22	.33	.44

* These estimates are based on Ohio Extension Bulletin 221 and Special Surveys in Wisconsin. They include interest, insurance, taxes, housing, repairs, and depreciation on both general farm machinery and tractors. They do not include the fuel and oil.

The Dairyman's Role As A Nurse

Condensed from Holstein-Friesian World

Melvin Scholl

WHEN caring for a sick cow the ability of the dairyman to recognize when his own services are insufficient and those of a veterinarian are needed distinguishes the real dairyman from the mediocre dairyman. That there is an important role for each of these guardians of the health of our dairy cows must be fully realized and understood. The services of the veterinarian are indispensable, and we should avail ourselves of his invaluable knowledge and experience whenever our own proves inadequate. The purpose of this article, however, is to point out some of the things the dairyman himself can do in caring for a sick animal—things he can do much better than the veterinarian whose short visits render impossible the close watch and assistance usually necessary for efficient, quick recovery.

All sick animals should be put in box stalls which are free of drafts and well bedded. If the weather is inclement, it is wise to blanket the cow and make her as

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Lacona, New York, July 1950

comfortable as possible. Bring her back to her feed slowly. Give her feed that she likes and that is appetizing. Keep her hungry and interested in eating. Feed small amounts of the highest quality of hay available. If it is very cold, warm her drinking water, but only enough to take the chill off. Most cows object to water that is too warm. Playing the part of a good nurse will go a long way in bringing a quick recovery.

No dairyman should attempt diagnosing a case before taking the cow's temperature. Hence, a clinical thermometer should be one of the first investments on the medicine shelf of every dairy farm. The experienced eye of a keen dairyman instantly detects a sick animal. There are many symptoms that should mean a warning of trouble ahead, chief among which are a dull, listless eye, a slower gait than usual, hair standing on end, and refusal to clean up feed. The intuition of the caretaker is the best guide. He may not be able to tell you exactly why he thinks an animal is sick, but working with them as he does, he can usually spot trouble almost before it makes its appearance.

Before administering any laxative or drug, the cow's temperature should be taken. The approximate body temperature of a cow is 102 degrees; somewhat less for calves. A slight variation of temperature one way or the other does not necessarily mean that anything is wrong, since certain conditions, such as weather, heat periods, and nervous excitement at calving sometimes tend to cause a little difference in temperature.

A cow's bowel movements, especially at the first sign of illness, should be carefully checked. If there is no abnormal temperature, the next thing to do is to run a urine sample of the cow to detect acetonemia. This is becoming such a common ailment in our dairy herds that the simple test should be learned by every dairyman. Acetonemia can appear at any time during lactation, but most generally is noticed shortly after calving and up to a month afterwards. If the cow has no temperature rise and no indication of acetonemia, she is probably off feed, especially if there is little bowel movement. A laxative is then indicated.

When acetonemia is indicated, intravenus injections of dextrose seems at present to be the best method of treatment. When a temperature of 103 and 104 develops, there is likely some infection somewhere. If the cow has recently calved, and there is a discharge and an offensive odor as well, metritis is likely present. This is the time to call a veterinarian. He will likely prescribe heavy oral doses of sulfa or penicillin injections or both. Again the infection may come from an infected quar-

ter of the udder. This is readily seen by an examination of the udder. A hard and swollen quarter with a high temperature and the usual symptoms of sickness (off feed, dull eye, etc.) would certainly indicate the cow was systematically infected from the bad quarter. Large doses of the sulfa drug administered orally together with the application of a hot water bag on the udder and frequent milkings of the infected quarter are the best methods of attack.

When temperatures of 106 and 107 and even higher are met, it sometimes happens that sulfa will not touch these infections, and it is likely that some form of hemorrhagic septicemia (shipping fever) is present. Injections of 100 cc of the hemorrhagic serum will usually bring the temperature down to normal.

In all cases, especially, where there is doubt in the dairyman's mind, and even after experience has taught him how to recognize these different ailments, it is the best policy to work hand in hand with a good veterinarian. Sometimes a phone call is all that will be necessary. He will confirm your diagnosis and suggest amounts of the different drugs to use. If he is a busy man, he will appreciate your doing some of these things, so that he will not have to be bothered. Your local veterinarian can be of inestimable value to you and to your herd.

The same rules apply in caring for the sick calf. Particular stress must be placed on sanitation and quartering of the ailing calf. Straw is much to be preferred over all other types of bedding for small calves. With proper feeding and management little trouble need be experienced with calves that are born thrifty. One need not have a fancy calf barn, but it should be kept dry, free from drafts, and well-ventilated, and should have plenty of light. An old barn no better than is found on any ordinary farm was used for years at the famous Maytag Dairy Farms for their small calves. The greatest drawback of this building was that it had few windows and they were small. To remedy this, several additional windows were cut on the south side and glass substitute was put in the openings. This not only admitted more light and warmth during the cold winter months, but the cloth glass let in the ultra-violet rays of the sun which common glass fails to do, and which are so beneficial to young calves.

Every dairyman has had calves born every now and then that were too weak at birth to nurse their dams. Nine times out of ten these calves can be saved with a little extra care at the start. They should have a small feeding of colostrum from their own mother just as soon after birth as possible. Though experts might lead dairymen to believe that you can raise calves suc-

cessfully without it—and they are right—it is well to keep in mind that colostrum is the very best food in all the world for the new-born calf, because it contains not only those food elements and vitamins so necessary for the proper start in life but also certain antibodies that protect the baby calf from disease during that dangerous time in its life. Colostrum more nearly approaches the chemical composition of blood than does milk.

Blanket the weak calf as soon as it is born, especially if its mother does not lick it. This will conserve the warmth in its body, and strengthen it. Vitamin capsules may be purchased that help such unfortunate calves. Feed the calf from a bottle with a nipple on it, making sure that all the things used in feeding are as thoroughly washed as though they were to be used by a small child. Karo syrup and raw eggs are valuable foods to strengthen and nourish the weak calf.

Should the calf develop pneumonia, sulfa is a valuable remedy, to be used on advice from the veterinarian. Subcutaneous injections of 10 cc of camphorated oil prove beneficial in most cases. The statement so often made, "It is better to underfeed calves than to overfeed them," should be doubly adhered to when caring for sick calves. Create an eppetite for food, keep them interested in their meals, and at the same time keep them warm and comfortable and nurse them well. You will be surprised how quickly they respond.

Take Pumps from Pits

Condensed from The Farmer

Arthur H. Schultz
North Dakota Agricultural College

SMALL, insulated, above ground houses for the water pump and pressure tank are being built to replace pits on many North Dakota farms. Houses aren't flooded in the spring, they permit of easy pump repairing in all seasons, and if properly built and heated with two 150-watt bulbs there is no trouble with freezing in even the coldest weather. Moreover, if there is power failure it is not difficult to attach a belt and operate the pump with the tractor or a portable gasoline engine.

These insulated above ground pump houses consist of a small house slightly larger than the assembled pressure tank and water pump. The house walls and roof

are framed with 2 × 6 material. The space between the studdings and rafters is completely filled with a fill insulation. Some type of electric heat and a good air thermostat complete the unit.

The first one we installed was on the Paul Schulz farm south of Fargo. This was installed in 1948. Complete records were kept on the temperature of this house and the amount of electricity used to keep the house from freezing. The temperature inside the house stayed at about 40° all winter. Only three kilowatt hours of electricity were used during the winter and this was used when the cover was removed to service the recording instruments.

The results of this first installation were so good that Fargo-Moorhead milk inspectors became enthusiastic and spread the word around the milk shed. As a result, about 50 or 60 of these installations were made in the vicinity during the past year. All of these installations went through the past winter without trouble. In most cases the cost of electricity in the pump house for the entire winter, in spite of the very cold weather, was less than $1.00. A number of these installations have been made throughout Minnesota. The University of Minnesota Extension Service engineers report similar results with their installations.

Power failure was only a minor problem even where farmers did not have a standby plant. One farmer licked this problem when the power was off this past winter by placing a blow torch in the house for a short period several times each day. Usually no extra heat was needed during the first day or two the power was off.

Here are a few recommendations that should be followed when building this insulated pump house.

Size: Check the size of your assembled pump and pressure tank before starting to build the pump house and then build it about 6 to 12 inches larger in each dimension than the size of the equipment. Inside dimensions of 36 to 42 inches wide by 42 to 48 inches long will be satisfactory for most pumps. A 36″ short type 42-gallon pressure tank is more satisfactory than the high type because it permits a smaller house to be built.

Foundation: Pour a good quality concrete foundation. The top must be level so the house will set even on the foundation. Seal the joints between the foundation and the sill with caulking compound.

Walls and top: Use 2 × 6 framing. Sheath it inside and out with any suitable material. ⅜″ or ½″ exterior grade plywood is probably the easiest to use. Install vapor-proof paper between the inside sheathing and the studding. Fill the space between the framing pieces with a commercial type insulation. The roof should be

hinged so that it can be easily opened.

Thermostats and heating units: Install a good heating type thermostat that has a range down to about 20°. These heating thermostats are usually available from most heating and refrigeration dealers. Set the thermostat to turn on the heating elements at about 34°. Two 150-watt light bulbs make excellent heating elements. Two heating elements are desirable so heat will still be available if one burns out.

Pressure pipe: Run the pressure pipe leading from the pressure tank along side the well casing to below frost level. The heat from the well will then help to keep the pressure pipe from freezing in cold weather.

Drain: Drain the floor of the pump house through a pipe run down from the floor to below frost level and then out 20 to 30 feet into the trench dug for the pressure pipe. Discharge the drain water through 3 or 4 sections of drain tile into about a quarter of a yard of gravel. Install a strainer over the drain opening to keep the dirt out of the pipe. The drain can be run over to a hillside drain, if a hillside is nearby.

If you are installing a pressure water system or if you are having trouble with a well pit on your farm, move your entire water system installation above ground. You will find that it will eliminate a lot of the problems that you have been having in the past or might have in the future. Complete plans for this installation are contained in Circular AE-34. This is available from North Dakota county agents or from the Information Department, North Dakota Agricultural College, Fargo.

A New Way To Kill Bugs

Condensed from the Farm Journal

A NEW way of killing insects on crops (and maybe preventing diseases, too) has begun to unfold.

We have been putting poisons on the *outside* of plants for a good many years. But one of these days, we shall probably start using chemicals that travel in the *inside of the plant.*

These compounds (called "systemic insecticides" because they circulate through the plant's system) move along with the plant's juices. When insects suck the juices or eat the leaves of treated plants, they die.

These chemicals are mixed with the soil and are taken in through the roots. Or they may be sprayed

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or dusted on and taken in through the leaves. Or you may put them on the seed before the crop is planted.

The plant picks up the chemical and, after a few days, becomes extremely poisonous to insects—but only for a short period of time. As far as we know, the plants are soon safe for either human beings or livestock to eat.

You can't buy these new chemicals yet, and the USDA has said "don't use them" until they're proved completely safe for humans, livestock, and the soil, too. So, for the time being, we'll go on spraying or dusting our crops with the insecticides we've been using.

We get most of these new bug killers from the calcium phosphate rock that we've used for fertilizer for years. Treating the phosphate rock with certain chemicals produces these systemic insecticides. There's practically no limit to the number of compounds scientists can get in this way.

In experiments with cotton in Texas, as little as 4 pounds per acre—put into the soil at planting time—controlled the ordinary cotton aphid and red spider mite for 5 months.

When the chemical was sprayed on growing cotton and then absorbed into the plant, *only one pound per acre* controlled aphids and mites for a month.

The results you get from treating seed are even more amazing. Putting *just two ounces* on the seed needed to plant an acre of cotton has controlled cotton aphids and red spider mites for 5 weeks, according to USDA tests!

When an even more powerful compound was used on cotton, only one-fourth as much was needed. Sounds incredible, but that is what happened.

These systemic insecticides are highly selective—one compound seems to kill only one or two kinds of insects. The one we mentioned killed only the ordinary cotton aphid and red spider mite. Other insects, like the boll weevil, were not killed.

This may be an advantage. We'll probably be able to use them without killing friendly insects like bees and lady-bugs. Incidentally, scientists believe that they will find a different compound in the same chemical "family" that will knock out the boll weevil.

Certain compounds mixed with the soil will kill corn borers, too. In one *greenhouse* experiment at the USDA Corn Borer Control Laboratory at Toledo, Ohio, the chemical was put into the soil when the corn was planted. Three weeks later, the stalks and leaves were fed to corn borers. Every borer died within 24 hours!

William G. Bradley, in charge of the laboratory says, "We have experimented with systemic insecticides for several years, and have tested nearly 700 different chemi-

cals. *So far, we have nothing we can recommend as practical under field conditions.* But results are promising, and we are continuing our experiments."

In small grains, spraying with one of these chemicals has given excellent control of greenbugs. In the greenhouse, resistant mites were killed with aerosol sprays containing a systemic insecticide.

At the Connecticut Agricultural Experiment Station, Dr. James G. Horsfall has tested systemic *fungicides.* He found that watering tomato plants with a solution containing one compound gave 100% control of fusarium wilt. However, he has no idea of how much of the poison eventually wound up in the fruit.

Another compound gave 50% control of wilt in chrysanthemums. In other work with non-food plants, Dr. Horsfall has *prevented* Dutch Elm disease by mixing a chemical into the soil around the base of the tree.

It is hard to say when we shall be able to use systemic insecticides on our crops. Much of the experimental work in this country has been done in the greenhouse. We still haven't tried out most chemicals under field conditions.

We do not know how much to use, and are not sure what they will do to the soil. The Food and Drug Administration has not had time to run tests to see if they should permit them to be used on plants grown for food or livestock feed.

While these systemic insecticides are new to most of us, scientists have known about them for a good many years. Many of them have experiments underway, and believe the insecticides look promising. Most of them, however, refuse to talk about any of their results.

In England, scientists have been experimenting with these compounds on a large scale. They are using them to kill aphids on potatoes, sugar beets, hops, tobacco, vegetable crops, flowers, and shrubs.

As far as this country is concerned, systemic insecticides will probably be first used on non-edible crops like trees, ornamental shrubs, and crops grown for seed, such as legumes and grasses.

It will take a lot more research and testing before they are ready, but it looks as if we may be on the trail of a whole new way to lick the bugs.

Milking Methods Important

Condensed from The Herd Builder

AFTER a cow has been fed, watered and stabled, and after her everyday requirements of care have been met, there remains one very important operation to be performed—*milking. Every other chore on the dairy farm leads directly to this one item on the farmer's list of work to be done.* This is the pay-off—the harvest, that pays him (or doesn't) for all the work of raising crops to feed his herd, harvesting these crops, and caring for the animals themselves.

Why produce good roughage, feed cows grain according to production, cull out our poor cows in an effort to produce milk economically, and then fall down on this—the most important job on the dairy farm?

There may, however, be a reason for being a little careless about milking cows. Like so many other types of work on the farm, or any other place, we get to doing things mechanically. Once we get into a routine we perhaps don't think too much about what we are doing, but just go ahead and do it. And now that most of our milking is done by machine we rely on this mechanical gadget to do the extracting.

Attention to the details of operating the machine; cleanliness while milking, and regularity of milking would not only improve the production in a lot of herds but would prolong the milking lives of the cows by protecting the health of their udders.

Cows are creatures of habit and do better when fed at regular hours. The same goes for milking. It is especially true that high producing cows should be milked at regular hours. Thirty pounds of milk in an udder puts a lot of strain on that udder!

Recent experimental data shows that poorly adjusted milking machines can cause udder trouble. Milking machine manufacturers have recommended pulsation rates and adjustments for their machines. They have tried them out, and their instructions should be followed. The same goes for vacuum,—and that's one point where trouble can increase tremendously —especially with high vacuum. The vacuum line should be checked twice a year, and that includes checking the vacuum gauge.

We often see machines of two or three different types, or conglomerations of parts of different types of machines scrambled together to serve as one machine. Even where all machines used in

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Ithaca, New York, November 1949

one barn are of the same make, we often see the pulsators on different machines running at different speeds! But, if a cow is milked with fast pulsations in the morning and with slow pulsations at night, it seems that this *could* cause irregular production. I think we have all seen cases where small differences of this sort threw cows off production—perhaps not seriously, but at the same time enough to put them off schedule.

Sanitation should be the watchword in all milking, not only to insure a sanitary product of good quality but also as a protection against infection of the udder. The use of a strip cup before putting the machine on a cow not only stimulates her to produce milk but also is a convenient way of locating trouble. If mastitis is present it will usually show in flakes on the strip cup screen. Washing udders with warm disinfectant solution stimulates milk production and helps produce clean milk.

These last few years we have heard quite a lot about stimulating milk production—getting the cow to "let down" her milk so that she can be completely milked quickly. But, quite often we see a whole string of cows being washed *before the machine* is put on the first one! This means an interval of five, ten, and in some cases thirty minutes between washing time and the time when the milker is put on some of these cows. Actually, when the cow's udder is washed the stimulation, or "let down" takes place almost immediately. Unless the milk is removed immediately, the "let down" effect wears off. *The cow's udder should never be washed more than a minute and a half ahead of the machine.*

The dipping of teat cups in disinfectant solution is practiced in many barns. One must remember, however, that the disinfectant solution rapidly loses its strength as it becomes contaminated with milk. Therefore, the teat cups should be dipped twice after each cow. First they should be dipped into cold water to rinse off any adhering milk. Next they should be dipped into disinfectant solution to kill any bacteria that may be lurking in their dark interiors. When dipping is done it is *very* important that the solutions actually touch every bit of the interior of each teat cup. In other words, they must be actually rinsed and not just hurriedly dropped into the solution and then pulled out. If the cover is left on the milker pail, or if the petcock is closed when the cups are dipped, an air block is formed and the solution doesn't touch the insides of the cups at all. At such times dipping is just a waste of time and energy. Also, remember, that the dipping solution will lose its disinfecting value if any dirt or milk gets in it. It really needs to be kept clean.

The latest recommendations say

—milk as quickly as you can. Don't drag it out. You can get cows into the habit of needing to be stripped by hand. Then the longer you sit the longer you'll strip. A lot of farmers don't strip at all by hand but do strip by machine.

The above are a few things that certainly should be watched on every farm. Give them a little attention, and remember that any additional milk produced by irregular, good, and sanitary milking is mostly clear profit.

New Pasture Patterns

Condensed from New England Homestead

G. O. Oleson

NEW and interesting pasture patterns are being cut these days for New England dairy farms: patterns that have been designed by the ingenuity and the thrift common among New England farmers. All patterns, however, are directed at one goal—that of reducing milk production costs. According to farm management studies, the cost of producing milk can be cut at least one cent a quart through better pastures and better quality roughage for winter use.

These new pasture patterns, or farm programs if you care to call them that, have been stimulated to a great extent by the New England Green Pasture program and contest now ending its third year as a New England farm feature. In 1949, 2,767 farmers enrolled.

Twelve months of green grass is the ambition of Weikko Holopainen of Hubbardston, Massachusetts, president of the recently organized Massachusetts Green Pasture Club. This may sound impossible, says Holopainen, but facts prove that dairymen can and must have a year around supply of green grass in order to produce milk efficiently.

"We in New England have ideal weather conditions for growing grass, but not for harvesting it in the form of hay. The warm moist weather of early spring, plus the addition of manure and fertilizer, makes grass grow more rapidly than cows can harvest it. The simplest answer for the dairyman to save this

Reprinted by permission from New England Homestead, Springfield, Mass., March 25, 1950

green grass of winter months is the silo."

Mr. Holopainen believes that a trench silo is a very important part of this new pasture pattern which is being developed.

To quote: "For me it has been the answer to 12 months of green grass and I think it is the answer for other small dairymen."

Beverly Rand of Sherman Mills, Maine, New England winner in 1949, was another enthusiast for the trench silo, only in Mr. Rand's case he used pea vines. He has attached his trench silo to the barn, and covered it with a permanent roof which has a door large enough to handle the end of the pea viner. Mr. Rand raises canning peas as a sideline to his dairy farm.

Holopainen has a special roof made in sections which he uses to keep the snow out of the trench. Only two of the 18 New England contestants in 1949 had trench silos, but many others asked questions about them and indicated interest in them.

Clearing new acres may look like a big job, but it pays big dividends, especially when the land is fertile and well supplied with moisture. Fred Bascombe and son Willard of Ashton, Rhode Island, one of the top three in Rhode Island in 1949, decided that they needed more land to grow that good grass for hay and silage. A meandering stream was blasted into a straight channel. Trees and brush and stones were cleared by a bulldozer and when the New England judges arrived they had a seeding of 4½ acres of fine bottom land for the production of ladino clover. Fish had been stocked into the stream.

Bahler Brothers of Ellington, top farm in Connecticut in 1949, had carried out a similar program. In their case, blasting the stream lowered the water table enough so that what had been a swamp is now a high producing field of ladino clover.

Other farmers, too, had cleared and bog disked fields and had reseeded them to good pasture-mixtures. They found that grass is so valuable in the dairyman's program, that it is advisable to produce all the roughage needed on the home farm. Still other farmers found it profitable to rent land from neighbors rather than to pay the price of shipped-in roughage.

Although New England is classified as a good area for grass, Nature sometimes misbehaves, as she did in 1949, leaving many fields dry and hard by mid-summer. Green Pasture contestants have found that grass is so valuable as a feed that it pays to irrigate their land.

Mr. Bascombe saved a hillside seeding simply by borrowing a pump and some pipe to give that hillside one good watering. Ran-

dolph Blackmer, manager of the Ashton Keynes Farm, which was tops in Rhode Island in 1949, was planning five waterholes which would provide fire protection as well as provide water for irrigation if necessary.

Bahler Brothers were irrigating from the stream in a nearby alfalfa field. Irrigation more than doubled the yield in a summer like 1949.

Ray White of Acushnet found that irrigation paid even though he had to use city water to do it. On a field seeded in February, Mr. White, through irrigation, had been able to cut two crops of hay and have some pasture through the months of July and August. Mr. White, however, was planning two ponds for irrigation, one to hold over a million gallons.

Sumner Brown of West Swansea, New Hampshire, was another farmer who found that irrigation pays in dry seasons. He was fortunate enough to have a good supply of water close at hand. By irrigation, five acres of ladino clover divided into 6 plots were carrying 27 cows and giving them plenty of pasture through the dry summer of 1949.

These new pasture patterns call for fresh clean water and plenty of it for the cows. The Strong brothers of Craftsbury Common, Vt., built a new water tank and piped water to it from the barn. Previously the cows had had to travel more than half a mile down over the hill to the old spring. They also piped water to the young stock pasture across the road and installed an ordinary barn drinking cup.

Several Green Pasture contestants blasted out old spring holes to make them deeper and cleaner. Holopainen supplied water to virtually all pastures through the addition of a specially built water tank. In another instance he siphoned water from a well to a drinking bucket so that the young stock would have plenty of clean water.

The 18 finalists in the 1949 Green Pasture program are also proof that New England thrift and ingenuity are not things of the past. Mr. White of Acushnet has a retail milk route with more than 500 cows so must do things on a larger scale than most farmers. His manager, Stewart Gilmore, designed a special manure spreader with an old automobile motor running the drum. They had built two of them each with 450 bushels capacity as compared to the average spreader of 100 bushels capacity.

The Whites had also built with their own labor a silo which was 63 feet high and 30 feet in diameter. Mr. White says he has never been able to fill it.

Mr. Holopainen, too, seems to have a genius for developing machines. Through special power

take-offs a small Fordson tractor can pull and operate a mowing machine and a field loader at the same time.

Cutting labor costs is, of course, another important item on the farm. And the trench silo does just that. It's quite an easy matter, Holopainen points out, to back a dump truck up to the silo and dump in three or four tons of green grass in a few seconds—quite a saving over that of blowing the grass to the top of an upright silo.

Other angles of this new pasture pattern are such things as more young stock being raised for replacements and more effort being made by farmers to provide that young stock with good grazing land. Young stock pastures are fertilized and reseeded if necessary to develop the young animals properly.

A good illustration of raising your own replacements can be seen on the farm of Strong brothers in Craftsbury Common, Vt. Over half of their herd of 40 animals were first and second calf heifers, yet the herd was averaging better than 8,500 pounds of milk.

Cutting hay earlier for good quality is another angle to the new pattern. Still another is putting the first cutting into the silo and making hay on the second cutting when weather conditions are better. This first cutting in the silo will serve as insurance for drouth periods.

Emergency crops, such as rye in early spring, sudan grass in midsummer, and oats, are coming into this new picture.

The present day farm looks like a checkerboard with pasture areas divided into small plots by electric fencing. A common exit or lane to all pastures cuts down labor costs. Cows harvest a small plot in a few days, then are moved on to the next and then to the next. Heavy fertilizing enables the plot to recover rapidly. Growth which is young and succulent makes for more milk, though the farmers are careful not to overgraze.

New England farmers are developing new pasture patterns—patterns which will enable them to produce milk economically.

Make Beef from Grass

Condensed from Capper's Farmer

M. N. Beeler

LOOKING for a forage market? If not, chances are you will be soon. Allotments and quotas will force more pasture and hay. On top of that there's a gradual voluntary shift to bigger sod-crop acreages. So how are you going to cash the extra feed?

A. J. Dyer and Paul O. Guyer, Missouri animal husbandmen, have a ready answer: "Turn the forage into beef." They cite 3 ways to do it, all based on 12 years of experimental proof.

The system preferred by Dyer and Guyer covers 2 years. This is the safest of the 3 because it takes full advantage of growth gains.

1. Start with 400-pound weanlings of good to choice grade. Then winter them according to kind of roughage available. Keep a mineral mixture before the cattle as long as they are on the place.

For the man without a silo: Carry the calves from December to April on good quality clover, alfalfa or lespedeza hay. That will take about a ton a head.

For the man who has a silo: Winter calves on 700 pounds hay and 1,600 pounds corn silage apiece. Or feed atlas sorgo or grass silage. Both must be high quality, and a little more likely will be needed than of corn silage. But it's a matter of beef pounds an acre. Atlas will make up in tonnage what it lacks in proportion of grain. And if a man's long on grass, ensiling is just another way to market more of it.

For the man who has mixed or poor hay: Add not to exceed 1 pound a day of protein supplement to the roughage ration.

Under any of the 3 ways of winter feeding, calves should gain about ¾-pound apiece daily. In spring they'll stand a little less a pound than they cost in fall. At least that's the experience of Dyer and Guyer the last 3 winters.

2. During the first summer, run calves on any green, fast-growing pasture available. This may be small grain, bluegrass, redtop, second-year sweet clover, lespedeza, brome and alfalfa, alta fescue and ladino or any similar mixtures.

Where lespedeza can be grown, pasture beef-makers call it just about foolproof. Missouri experimenters go from small grain in spring to Korean and pasture it

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until seed hardens in fall. From then to November 1 or 15 they graze first-year sweet clover.

The steers ought to gain 225 to 250 pounds a head the first summer. That, with 100 pounds the first winter, plus 400 originally purchased, adds up to 750 at the beginning of the second winter.

3. On 800 pounds hay and 2¼ tons silage or 1½ to 1¾ tons of hay the second winter, a steer should gain 1¼ pounds daily. But Dyer says that may be too much. He and Guyer believe 0.7 pound a day is probably enough. Cattle will do better on grass when they make only light gains during the winter.

4. Pasture the second summer the same as the first, but allow enough more area to make up for bigger steers. From 15 to 20 percent of the cattle will be well enough finished to grade "good" right off pasture, especially if it's lespedeza.

5. Begin feeding remaining steers in dry lot after the pasture season. They should gain enough to grade "good" in 6 to 7 weeks on 10 bushels of corn and enough protein supplement to balance it. Sell around November 15. They should weigh 1,100 pounds or better.

Under this 2-year system 60 percent of the gain is from pasture, 30 from roughage and 10 from grain. That low grain consumption is the secret of safety. W. R. McMillen, Missouri economist, said that in only 2 years since 1925 would cattle handled this way have failed to make money.

It takes a bit of pasture planning and management to make this 2-year program work. You'll need an acre of pasture for a yearling and 1¼ to 1½ acres for a 2-year-old. Then you'll need some pasture reserve for any gaps that may come between early spring and summer or late summer and fall. Fertilizing to insure lush growth is just plain good sense. So also is controlled grazing. Alfalfa pastured too hard one season is likely to go out the next. Ladino alone, Dyer believes, may be dangerous.

If you have 100 acres of good grazing, buy about 60 calves the first fall. Feed out half of them as yearlings and hold the rest another year. Buy more calves that fall. But feel your way until you know how many the pasture and roughage program will carry safely.

For the man who wants a quicker turnover, the Missourians suggest a 1-year system. This bypasses the first wintering and first grazing season. The beefmaker buys growthier feeders instead of raising them himself from calves. Thin yearlings will be a good buy if they can be had at a price about equal to the cost of yearlings developed under the 2-year system.

Winter and summer these growthier cattle according to di-

rections in the second year of the system. Begin feeding in dry lot at the end of the pasture season. These steers also will finish on 10 bushels of corn but it may crowd them to grade "good" by November 15. Under this system 40 per cent of the gain will be made on pasture, 30 on roughage and 30 on grain.

If you want to make certain that these yearlings will go to market in late October or early November, you can buy the insurance with more corn. Feed 8 to 10 bushels a head during winter. This probably will increase gain to 1½ pounds a day, decrease gains on grass and increase costs. Still the cattle may be fatter July 1 or August 1 than those wintered without grain, and they'll be that much closer to finish. Total corn required for wintering and fall dry lot may be 20 bushels.

Dyer and Guyer suggest still another 1-year system. This one by-passes the second year of the 2-year system but takes more corn. Buy heavier calves, say 475 pounds. Winter as under the first plan on good hay, alone, hay and silage, or mixed hay and protein supplement, according to feed available. Pasture during summer and start feeding grain about October 1. They'll finish to "good" grade early in January, and corn consumption will total 20 to 25 bushels.

January may not be so good a market as November. To avoid that risk a beefmaker might choose to begin dry lot or pasture feeding in July or August.

The big advantages of the 2-year system over the two 1-year systems are: (1) More beef from pasture and roughage which makes a market for sod crops. (2) A finish to "good" grade on a minimum of corn which makes gains cost less. (3) Elimination of one set of freight, buying, selling and shrinkage costs which may amount to $18 or $20, or more, a head depending on haulage distance.

Any one of the 3 systems will work with a cow herd, which is another way to sell more grass and roughage. It also sidesteps all but the final marketing costs. Instead of buying cattle, the owner just puts calves or yearlings of his own raising under the plan that meets his needs.

The Feeding of Horses

Condensed from The Maryland Farmer

Logan T. Wilson, Ph.D.

SUCCESSFUL horse feeding requires a skill that is more or less peculiar to this animal. Horses are not fed for production of milk, meat, or eggs, but to develop and maintain their athletic ability and attractive appearance. For one thing, feeds which cause a laxative condition are not desirable. Also horses are more sensitive than most other farm animals to spoiled or unsuitable feed. Horses are more inclined to overeat, and they cannot regurgitate and thus get rid of gas or food for the stomach, so that digestion disturbances can be quite serious.

Hay and grains are the staple feeds for horses. Pasture may be the chief feed for brood mares and colts, and horses that are idle or at light work.

Grass hays, particularly timothy have been the favorite kinds for horses. They are not laxative and are usually less dusty and less inclined to be moldy than legume hays. Dusty legume hays may cause "heaves." Horses are less apt to overeat on grass hays than on alfalfa or clover hays. On the other hand, legume hays are higher in protein, vitamins, and minerals. For brood mares, young growing horses, and breeding stallions that are not on pasture, it is best to feed 1/2 to 1/3 of the roughage as legume hay. A good mixed hay such as clover and timothy that is cut early and nicely cured will also supply the nutrients desired for these classes of horses.

Pasture for horses should be managed in the same way as that for other livestock. Here again a mixture of legumes with grasses is preferable to pasture that is predominantly grass. Proper liming and fertilizing of pastures are important. The reputation of the Blue Grass Country of Kentucky for growing fine horses is attributed to the natural fertility of the limstone soils in that area.

Silage can be fed to horses in limited amounts if it is available. It is a good source of vitamin A for winter rations. If it is used, one should be careful not to feed any that has been molded.

Straw can be fed to idle horses if properly supplemented, but it is not of much use for working horses. It will supply some energy for maintenance but has practi-

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Baltimore, Maryland, July 1950

cally no protein, vitamin, or mineral value.

A considerable variety of grains and grain mixtures can be fed. Oats are the favorite grain as they are bulky and less likely to cause trouble from overeating. They are well liked by horses. Other grains such as corn, barley, and milo are quite often more economical to use than oats. They usually give best results when mixed with oats. Brewers' Dried Grains can be used in the grain mixture, as they are bulky and help to increase the protein content. Cane molasses is a common ingredient in grain mixtures. It adds palatability, cuts down dustiness, and is a good source of certain minerals and vitamins as well as being an economical feed. Alfalfa meal in the grain mixture is excellent for building up its vitamin, mineral, and protein value. Dehydrated alfalfa meal usually has a higher value than alfalfa which is field cured. Linseed oil meal is the favorite higher protein ingredient for horses. It helps to tone up the digestive system and to maintain a glossy hair coat. Wheat bran can also be used. It is bulky and rather laxative and does well in the ration of idle horses.

Salt should be supplied free choice and it can also be included in the grain mixture. A supplement of other minerals fed either free choice or in the grain mixture is good insurance against mineral deficiencies especially when there is a question about the mineral content of the hay or pasture available.

Work Horses should be fed according to their size and to the amount of work they are doing. On a ration of hay and a grain mixture, they should get 2.0 to 2.5 lbs. of total feed per 100 lbs. of body weight. At heavy work this should be made up of a little more than one-half grain mixture. In feeding all horses the amount of grain should be regulated to keep them from getting too thin or too fat. At medium or light work, the grain can be cut down and hay increased. If pasture is available at night it can be used in place of part of the hay. The biggest share of the hay should be fed at night when there is plenty of time to eat and digest it. Smaller feedings are given in the morning and at noon or grain only can be fed at noon. It is best to divide the grain into equal feedings at morning, noon, and night. Be sure to reduce the grain when horses are taken off of heavy work.

Saddle horses or other pleasure horses should not be fed too much if they are to be kept trim in appearance and have good action. About 10 lbs. of hay per day and enough grain mixture to keep them in nice flesh should be fed. Overfeeding and lack of exercise will reduce the useful life of such horses.

Race horses during training and racing are usually kept on limited amounts of hay, often not more than 7 to 8 lbs. per day. They should be muzzled if they go to eating bedding. Enough grain mixture should be fed to keep up their condition and vigor. Since hay which supplies much of the critical mineral and vitamin needs is limited, it is important that the grain mixture be well formulated to supplement the hay that is fed. It should supply ample amounts of protein, calcium, phosphorus, vitamin A, riboflavin, and other B-complex vitamins.

Brood mares and foals have the highest requirements for protein, vitamins, and minerals. Good pasture when available is the best feed for mares and colts. Some mares may need a little grain in addition to stimulate a good milk flow. For rapid growth, foals should be fed grain in a creep. This will also get them used to eating grain before weaning. Putting salt blocks near a creep in a pasture will encourage the mares to stay near it and give the foals more time to eat. When pasture is not available, 1/2 to 1/3 of the hay for brood mares and growing colts and fillies should be legume hay. If legume hay is not fed, extra protein ,minerals, and vitamins supplied through the grain mixture are recommended.

Orphan foals can be raised on cow's milk or on evaporated milk. If the foal has not had colostrum from its dam, an injection of horse serum is recommended. It would also be advisable to supply extra vitamins, especially vitamin A at this time. For the new-born colt a fairly low-fat cow's milk should be used. To each pint of milk add 1/4 pint of water and 2 teaspoonfuls of corn syrup. Feed every hour or two from a nursing bottle until the foal can be taught to drink from a pail. Mares' milk is higher in vitamin C or ascorbic acid than cows' milk, so it may be advisable to feed in the milk about 1/2 gram per day of ascorbic acid, especially if any infection or fever occur.

There is evidence that "moon-blindness" or periodic opthalmia can be prevented by feeding riboflavin, although this vitamin does not cure it once it has developed.

The condition called "Founder" has long been known to occur at times after horses have eaten large amounts of grain. This condition now appears to be due to the formation of histamine by the action of bacteria on the grain in the digestive tract.

Azoturia is a condition that affects well-fed horses when they begin to work after a day or two of idleness. It gets its name from the dark-colored urine excreted. It can be avoided by reducing the grain fed to working horses on their idle days.

Proved Sire Records

Condensed from Wisconsin Agriculturist & Farmer

You can't take dairy records at face value!

"Too many things besides breeding influence them," explains E. E. Heizer, of the U. W. Department of Dairy Husbandry.

That's why Heizer and N. D. Bayley, U. W. dairy expert, have been working on new methods of making dairy sire provings more reliable.

To prove a bull in the past, the butterfat and milk production of a dam were measured. Then the production of her daughters was measured. The difference in production between dam and daughter was credited to the bull used in the proving.

Things like age, length of lactation and the number of times cows are milked each day have been considered in past provings.

But these three factors didn't show the entire picture Heizer and Bayley felt.

There were just too many times when sires, rated highly in natural service, just failed to show up as well when used for artificial breeding.

What are some of the things that might account for the difference? Length of the cow's last dry period, or the condition of dry cows and heifers have a bearing on production.

The number of days the cow is with calf while milking plays a part. So do the amount of protein in the ration and the rate of feeding digestible nutrients. Size of the herd makes a difference.

Heizer and Bayley have worked out an index to account for some of these variations in environment. The study from which their index was built involved records on nearly 1,000 cows in 47 Wisconsin herds.

Here's how the index looks:

As in the past, production of dams and daughters is compared. Then the environment index is worked out to show how much of the difference between the production of the daughters and that of their dams is due to the factors of environment.

One of the bulls tested under the new index didn't do so well. His daughters produced 25 pounds of butterfat more than their dams by the old proving method.

By use of the index, it was found that the daughters had a 37-pound advantage over their dams due to better living conditions.

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In other words, the bull actually had nothing to do with the increase in production!

The big advantage in the index is this. Bulls proved under top conditions, by the old system, may do a good job of increasing production in your herd and turn out to be duds in your neighbor's.

Only by a system of indexing which takes into account the living conditions in the two herds can you estimate the bull's actual ability.

This isn't the final answer in proving sires. Disease, injuries and pasture conditions have a bearing. But these haven't been included in the index because they're difficult to measure.

Feeding Lambs They Don't Own

One of Missouri's largest livestock feeding enterprises is unique in that the feeders do not own the livestock being fed. The Williams Feeding Company, at St. Joseph, custom feeds lambs from the wheat fields of Kansas and other Western States.

Last year the company fed 50,000 lambs. Many come into St. Joseph following blizzards or dust storms in the plains country. The custom feeding service allows owners to continue feeding and to miss glutted markets following periods of bad weather in the range or pasture country.

The Williams firm rents the space, and shelter, from the St. Joseph Stock Yards Company and buys all the feed. They base their charges on a percentage of feed cost—so actually it's a cost-plus proposition.

Recently the company had about 11,000 lambs on hand. They are kept in the barns and pens just east of the main yards of the St. Joseph stock yards used for the Interstate Baby Beef Show. Altho the lambs are crowded into a small area, this does not seem to adversely affect gains.

The ration consists of 40 per cent corn, 4½ per cent soybeans, ½ per cent mineral, 12 per cent molasses, and the remainder alfalfa. The entire ration is ground together in a mill.

Lambs are put on full feed in about 10 days after they are received. At first the ration consists of about 25 per cent corn, and this is jumped 5 per cent every other day until the 40 per cent is reached. As high as 65 per cent corn has been fed.

—Missouri Ruralist

History of Agricultural Teaching

Condensed from Better Farms

Dr. Russell B. Dickerson
School of Agriculture, Pennsylvania State College

WHEN we consider that practically everything we eat—except salt—and all that we wear—except jewelry—are derived from basic farm products, the importance of agriculture is placed in proper perspective and we begin to appreciate the magnitude of the industry. Then, when we consider the complexity of the many problems concerned with production, marketing, distribution and management, the obvious and ever continuous need for education becomes apparent. Agricultural education as we know it today had its beginning at a level far below that of college grade. It is interesting to review the historical background.

Town meetings in New England, which began in 1633, represent the first organized effort on record of farmers to improve their own welfare. Then followed the "lyceums" which were voluntary associations of farmers and mechanics "for the purpose of self-culture, community instruction and actual discussion of common public interests." By 1839, there were more than 3,000 lyceums in existence and they provided educational leadership in agriculture throughout the rural areas of the Northeast colonial states.

For more than a century before organized instruction in agriculture was offered in Pennsylvania, a number of societies were actively engaged in disseminating farm information. One of the first of these was the American Philosophical Society founded in 1744 under the leadership of Benjamin Franklin. While primarily a scientific society, it published many articles on agriculture. The first strictly agricultural society in the nation was the Philadelphia Society for Promoting Agriculture, organized March 1, 1785. Both George Washington and Benjamin Franklin were elected to membership and took a keen interest in promoting the welfare of the society. Similar societies were organized in South Carolina in 1785, New York in 1791, Massachusetts in 1792 and Connecticut in 1794.

Under the fostering interest of Benjamin Franklin, the first formal effort made in the U. S. to present the need for agricultural

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Pulaski, New York, July-August 1950

education to a legislature and to provide for instruction in the common schools seems to have come about through the efforts of the Philadelphia Society. Their many efforts continued without a great deal of success and finally led to the organization in Harrisburg in 1851 of the Penn. State Agriculture Society.

This organization proceeded almost immediately with plans for an agricultural school. At its second annual meeting in Harrisburg, January 18, 1853, a committee reported favorably upon the matter. So it was that the Farmers High School, incorporated February 22, 1855, opened its doors four years later, February 16, 1859, with the announced object "to develop and adopt a system of instruction which shall embrace, to the fullest extent possible, those departments of all sciences which have a practical or theoretical bearing upon agriculture and agricultural interests."

From the beginning, instruction was organized on a collegiate basis and was of collegiate grade. When the school was opened, there was a student body of 69 and this grew to 119 later in the year. These first students were recommended by officers of the county agricultural societies, with the number of students from each of the then 30 counties apportioned upon the basis of the number of taxable inhabitants. The original curriculum provided for one course of study whose primary consideration was instruction in the theory and practice of agriculture.

It was the local county agricultural societies which continued to provide a vehicle for the expression of the more intelligent and progressive farmers in furthering their demands for national legislation. In 1862 there were 941 county agricultural societies, when delegates from 23 states and territories met and organized the United States Agricultural Society.

These agricultural societies were, to a very large extent, responsible for the introduction and enactment of the first Morrill Act which was introduced in Congress in 1857. This was the first action taken by the federal government to supply funds for the promotion of agricultural education. As a result of long and continued effort of the agricultural societies, President Lincoln signed the Morrill Act in 1862. Under its extensive terms, the act authorized the establishment of a land-grant college in each of the several states. The Morrill Act, therefore, is generally known as the Land-Grant College Act.

Thus we have the emergence of the Farmers High School of 1855, later named The Agricultural College of Pennsylvania in 1862, and the Pennsylvania State College in 1873. From a beginning of 119 students in 1859, then two in 1880

and none in 1882, the school languished and the situation was very discouraging.

Another direct benefit of land-grant colleges has been the short courses for farmers. The first in the nation was sponsored by Prof. W. A. Henry at the University of Wisconsin in 1886. At Penn State, the first short courses in agriculture were offered in 1891, only to be suspended in 1895 and resumed in 1899. Prior to 1907, the number enrolled in short courses greatly outnumbered regular students in agriculture. The turning point in the history of Penn State's School of Agriculture came in 1907 when adequate facilities were provided. From a student body of 133 in 1908–09 and 1,178 in 1938–39, the enrollment for 1949–50 was 2,316. When our two-year course was instituted in 1906–07, there were only five students but since that time a total of 5,261 students have enrolled.

Agriculture is America's largest single industry. It is not only large but also extremely varied. Agriculture supplies needed food, oil, fat, fiber and forest products. And it is the base upon which our entire economy rests. In addition, American agriculture has made, and is making, important and urgently needed contributions toward solving the nutritional, economic and social problems of the entire world.

More than six million individual farms are now operated. We have about 250,000 scientists serving in agriculture and its related fields. More are needed if we are to improve and increase crop and animal production, conserve and improve soil, control or eliminate plant and animal pests, improve the efficiency of processing, storage and distributing services, discover and apply new scientific and engineering principles to agricultural production and distribution, and extend modern social and humanistic principles to rural living.

About eight million people make their living by providing necessary supplies to farmers and by moving our huge agricultural production to the consumer's table. Their tasks vary from supplying money, feed, fertilizer and a host of other necessities to farms; and processing, storing and distributing the raw materials produced by farms.

Today, the need for men and women trained in scientific and technical agriculture is great. For many years there has been a large and growing demand for agricultural graduates and, for several years, this demand has exceeded by a wide margin the number of graduates available for salaried positions. As agriculture has developed and become more complex, the need for trained technicians, research workers, educators and administrators has become greater.

Our objective is to train men

and women for greater service to agriculture. In our School of Agriculture, the work is planned to provide a sound superstructure of applied science and technology, anchored upon a firm and broad foundation of pure science, social and humanistic studies. Upon graduation, a student will have devoted about one-fourth of his time to pure science, one-half to applied sciences and technology in the various fields of agriculture and one-fourth to social and humanistic studies.

Graduates are prepared for general farming and rural living, as managers for specialized and large-scale farm enterprises or for teaching in high schools and colleges. Others become research workers for the government, agricultural experiment stations and privately owned institutions. Some are adapted for work as extension specialists, county agricultural and home economics agents, civil service work in agriculture and forestry, or in various types of professional and commercial activities connected with agriculture. Commercial work in the latter category includes farm machinery, electric power and equipment, seeds, feeds, fertilizers, insecticides and the storing, processing and marketing of agricultural products.

There was a reported total enrollment of 43,000 students in 47 agricultural colleges for the year 1948–49. Degrees in agriculture granted in that year included 18,727 Bachelor of Science, 1,966 Master of Science and 321 Doctor of Philosophy. As an indication of how education in agriculture has grown up, a brief review of our curricula may be of interest. This may be somewhat more extensive than in many other states because with more than 2,300 agricultural students our enrollments give us a rank that is second only to Iowa State College.

Currently, we offer 16 four-year curricula, one two-year applied course with nine options, 12 one-week short courses, 7 two-week short courses and 3 four-week short courses. In addition, various departments of the school conducted 59 conferences lasting from one to five days. We are proud of our resident teaching staff numbering around 200 and, in terms of one or more degrees obtained off our own campus, representing a total of 65 different colleges and universities in 45 states. We have 238 graduate students who have come to us from 25 different states, territories and countries.

Resident instruction must recognize the responsibility of working with students and faculty alike in order that the graduate may have a broad and liberal education. We subscribe to the philosophy that the whole job cannot be done within the classrooms and laboratories. Compared with past years, there is more emphasis today on

teacher-student planning, and a recognition of the proper importance of intra-curricular activities such as the student clubs of which we have 19 in the agricultural school. These intra-curricular activities give students training in citizenship and leadership and help to develop personality, poise, good manners and the ability to cooperate with people.

At Penn State, and all other land-grant colleges, it is the primary objective to train and prepare liberally educated graduates so that they will be qualified to assume greater responsibilities in furthering the development of our nation's greatest single industry, which is agriculture.

Ways To Cut Down Baby Pig Losses

It takes a couple of days for the temperature-regulator of newborn pigs to learn how to keep the body temperature up to normal 102.5 degrees according to a research study reported by H. W. Newland of Michigan State College.

The body temperature of 25 newborn pigs dropped three to nine degrees during the first hour after birth when the barn temperature was 65 to 75 degrees. The average decrease in body temperature was four degrees, and most of it occurred during the first 20 minutes of life. By the time the pigs were an hour old the body temperatures began to rise from the low point—if the pigs lived, normal temperature of 102.5 degrees being reached by the time the pigs were two days old.

One big "if" concerning the ability of the newborn pigs to properly adjust body temperature was their weight at birth. The body temperature of pigs that weighed less than two pounds at birth dropped about twice as much following birth as did that of pigs that weighed 2.5 pounds or more. And, of course, if chilling goes too far the newborn pig dies.

Here's another fact related to loss of young pigs shortly after birth. Pigs that were 18 hours old were put in temperatures of 34 to 36 degrees for three hours. Body temperatures dropped two to four degrees, the greatest decrease being for the lightest weight pigs. Similar pigs 50 hours old instead of 18 hours, maintained about normal body temperatures when the barn temperature was 34 to 36 degrees.

In a few words this Michigan research shows the importance of (a) large pigs at birth, (b) and keeping the pigs from chilling for two days in reducing death losses among newborn pigs.

Liquid Manure

Condensed from Hoard's Dairyman

William G. Schulz

MANY Pacific Northwest dairymen are finding the use of liquid manure or cow's urine just as valuable an asset on the small farm as on the large one. This is especially true where the soil is good, where abundant forage can be produced, and where, therefore, the fields can be intensively grazed or heavy hay crops taken off.

Ernest Crook, Yamhill County, Oregon, is grazing 30 head of milk cows on the surprisingly small area of 13 acres all summer long —thanks to sprinkler irrigation and heavy fertilizing. This farm of 120 acres has 65 acres in cropland, the remainder being in brush and timber. It is low, level, and rich bottomland for the most part. Hay and grain are produced on about 45 acres.

The remaining 20 acres are given over to Crook's 13 acres of irrigated pasture and about six acres in temporary pasture which Crook uses for early sping grazing. He prefers not to turn stock onto the irrigated pasture too early in spring.

Adjoining his milking barn, Crook has an all-concrete liquid manure tank, 36 ft. long by 14 ft. wide by 7 ft. deep. It is exactly the same width as the barn. All urine from the cows drains down into this tank, along with considerable solid which also washes into it, as the barn is hosed down with water after each milking. In summer, cows are in the barn only about 3 hours per day, so most of the liquid accumulates in winter.

For spreading, Crook uses a wooden tank wagon made of tongue-and-groove. It holds about 360 gallons. Liquid manure is pumped up out of the tank by a 2-horsepower motor. A pipe arm with an elbow projects up about 9 ft. above the tank and extends out into the barnyard about 20 ft.

Hooking his tank wagon to his tractor, Crook simply backs the wagon to this pipe, starts the pump motor, fills the tank, then hauls the liquid out to the fields for spreading.

"The pump has a three-way valve," Crook explains, "so that you can load the liquid into the tank wagon at once if it is well stirred, or you can shut off the valve and run it back into the tank. By running it back a few

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times, the solid is broken up and thoroughly mixed with the liquid."

Crook finds that his tank fills in about three months, and contents average about 55 to 60 per cent water. He spreads liquid manure at irregular intervals. Ordinarily, it can be applied only during damp, cool weather. But Crook, by using sprinkler irrigation, finds he can use it safely in warm weather. He has had no traces of "burning" of the grass.

Pastures are divided into three rotational grazing plots and 30 cows are grazed on each for several days. As soon as they have been moved into the next plot, Crook gives the plot just vacated a treatment with liquid manure, then immediately starts up his sprinkler irrigation system.

Irrigation water is taken from a river close by and the sprinklers are run in two 10-hour settings daily. "I find that all the liquid manure is washed down thoroughly and soaks quickly into the ground," Crook says. "Twelve to 14 days later, when cows are back on that plot, there is no trace of odor or taste from the manure. Meanwhile, grass has made heavy growth, and it's all I can do to keep the cows ahead of it. Pasture mixtures are ladino clover and rye grasses."

Crook also uses about 200 lbs. superphosphate per acre and here again he uses his head to save his back. Each year he dumps thirty 100-lb. sacks of superphosphate into the tank and mixes it with the contents. Thus he eliminates the extra labor of spreading commercial fertilizer.

"I am apparently getting sufficient nitrogen from my barn manures, but I need phosphate to boost the clovers," Crook explains.

Advantages which Crook cites after several years' usage of liquid manure are:

It is much easier to put on than the solid manure and commercial fertilizers. Besides, and very important, there's very little loss of valuable plant food elements through leaching, drying, and fermentation. Finally, there is practically no waste of any of the cows' excrement. And, while commercial fertilizers must still be used, Crook and other dairymen report that their bills for these are cut down considerably. Finally, Crook states that liquid manure fits in ideally with irrigated pasture which, because of its intensive, all-summer grazing, demands much heavier fertilizing than non-irrigated. Grass growth, too, is hastened since the minerals in the liquid are in a form almost immediately usable by the grasses and clovers.

In conclusion, the following pointers based on the experience of Pacific Northwest dairymen and liquid manure field tests by the state colleges and experiment stations will be of value to farmers

in other areas interested in this subject:

In the Pacific Northwest, a storage capacity of about 150 cubic ft. per cow is a minimum capacity for liquid manure tanks where the cows remain in the barn during most of the winter months. This is the recommendation of Oregon State College Soils Specialist Arthur S. King.

King also points out that tanks may be built of wood as well as of concrete (though concrete is preferred by most dairymen). A wooden tank will cost approximately one-third as much, and if well constructed will be usable for about 20 years, King says.

"It is necessay that the tanks be built in a location that will permit draining of the barn liquids into the tank," King adds. "In some sections it may be necessary to obtain the approval of the dairy inspector as to the exact location of the tank. With some barns it may be necessary to rebuild the gutters so that the drains are in the proper direction to permit flow of the manure into the tank.

"Tanks can be located at a considerable distance from the barn, provided a pipeline at least 6 inches in diameter is provided to carry the manure from the gutter into the tank. Tanks can easily be covered with tight covers and a small amount of screen will cover any necessary openings. From the standpoint of sanitation, flies, or undesirable odors, the liquid tank is ideal."

Until recent years the only kind of pump suitable for pumping up liquid manure out of a tank was one made in Switzerland. However, similar pumps are now available in this country. But in some cases a pump may not be necessary.

"If the dairy barn happens to be situated on a hill, it is often possible to drain the storage tank into the tank wagon by gravity," King points out. "The liquid is led through a 6-inch pipeline which may be constructed of either clay or concrete sewer tile, to a point where it is possible to drive the tank wagon under the discharge pipe. The latter should be a steel or iron pipe on which is fastened a gate valve and a movable elbow to permit discharging the liquid into the tank wagon.

"With such an arrangement, it is possible to do all the work of spreading without getting off the driver's seat."

At the John Jacob Astor Experiment Station at Astoria, Oregon, for instance, such a system is used. There the dairy barn is built on a hillside and liquid manure from the big concrete tank nearby drains by gravity flow through a pipeline outlet for loading into the tank wagon. Likewise at the Oregon State College dairy barn, at Corvallis, barn manures are

hosed down into a concrete tank from which the liquid drains by gravity flow into irrigation ditches. There it mixes with the water and is distributed over the fields.

On many farms, where some general farming is done along with the dairying, ample straw is often available. In such cases it is a good practice to keep cows in a loafing shed, King advises. It is possible to use straw enough to prevent any loss from leaching and the continued drainage of the material prevents any fermentation loss.

"When loafing sheds are used, the liquid tank may be used to store the manure from the milking barn," King says, "then a tank of smaller capacity—75 cubic ft. per cow is adequate."

New Grass for the Western Range

Condensed from American Forests

Anthony Netboy

In experiment stations operated by the state agricultural colleges or bureaus of the U. S. Department of Agriculture, scientists are quietly developing techniques for restoring an important portion of America's natural wealth—its western grasslands. Without fanfare, the range men are trying out species of forage plants under various climatic and soil conditions to find those which will thrive on the great western ranges where many decades of intensive grazing has sharply reduced the good native grasses and permitted useless invaders to take over. The success already achieved has been remarkable.

Until a generation or so ago, the western grasslands—like our forests—were regarded as virtually inexhaustible. Americans did not realize what had happened to this vast domain until Congress in 1935, acting upon a resolution of Senator Norris of Nebraska, requested the U. S. Forest Service to make a comprehensive investigation. Its report, *The Western Range—a Great But Neglected Natural Resource*, revealed startling facts.

The range had lost nearly half its grazing capacity since the American livestock industry had come into being. This meant that whereas it was once capable of supporting 22,500,000 animal units, it was then able to carry only

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10,800,000. On nearly fifty-five percent of the western range, forage values had been reduced by half.

What had happened?

Heavy stocking with cattle, sheep, and sometimes horses and goats, combined with failure to repair accumulated damage, brought ecological changes that were creating a forage famine. The more valuable plants—those palatable to livestock—had become scarce or extinct on many areas. Species such as prairie beardgrass and sandgrass were replaced by unpalatable sand sagebrush and yucca, wild-rye by greasewood, winterfat by shadscale. On far too many areas worthwhile plants (for livestock) disappeared and less desirable species—such as thistles, cheatgrass and sagebrush—promptly took over.

Where startling changes in the plant community had not occurred, the density and productivity of the better forage species such as perennial gramas and fescues, had been reduced. In some places young forest growth spilled over into the mountain meadows, or brush replaced the tall luscious grasses.

Steadily the range had declined over the years. Of the 728 million acres of western grazing lands, 589 million were seriously eroding, thus adding silt to the great western waterways and contributing to flood discharges.

Only after these melancholy facts had been brought to light were efforts made to turn the tide of depletion. Several federal research bureaus tackled the problem intensively. In the past fifteen years much has been learned about range reseeding and a great deal has been done.

It has been established, for example, that where there is some good topsoil left, and there are remnants of the better kinds of grass, improved grazing management alone may restore proper forage and desirable watershed conditions. In other places, the noxious or low-value plants—sagebrush, for instance—that compete for the limited supply of moisture can be burned off or grubbed out in order to give the more desirable species a chance to recover.

On about eighty million acres, however, where the most useful grasses have been chewed up by cattle, sheep and other animals, reseeding is the only hope of restoring grazing capacity in our lifetime.

A good start was made in reseeding western range lands before World War II, and even greater progress has been recorded since 1945. But a vastly accelerated program is required. To meet this need on public lands Congress passed the Anderson-Mansfield Act in 1949 which would set up a fifteen-year program, costing over $40,000,000, on range lands under

the jurisdiction of the U. S. Forest Service (national forests).

So far, about five million acres of public and private lands west of the 100th meridian have been converted from economic liabilities to assets through reseeding. The work has been done mainly in Montana, Utah, Nevada, Idaho, Colorado, Arizona, Oregon and California. In Montana alone over 1,500,000 acres have been restored, mostly private land. Unfortunately large areas which were thus rehabilitated have been plowed for wheat since the wheat boom began. When the drought returns much of this land may again need reseeding.

From five to seven million acres of range have also been revegetated in the region lying east of the 100th meridian, mainly Kansas and the Dakotas. So promising are the prospects of revitalizing deteriorated grazing lands through reseeding that research has begun in the South to test the adaptability of various legumes and grasses to the hot, moist climate.

It is interesting to note that large-scale public programs came after private landowners showed the way. But as the research men came up with newer and better techniques, more and more private owners were persuaded that relatively small expenditures in revegetation will increase the carrying capacity of their ranges and stabilize their ranch enterprise. Under the agricultural conservation program, administered by the Department of Agriculture, such owners can recoup up to eighty percent of the cost of the seed—a major expense item—if they follow certain specifications.

Old-time stockmen are amazed at the results of this new technique in fructifying depleted ranges. They see mountain meadows which had lost most of their palatable native plants densely sodded again with nutritious forage grasses — tall oatgrass, smooth brome, and other species never grown there before. Likewise, many dry ranges in the foothills of the western mountain chains, which recently supported little more than sagebrush, are now covered with crested wheatgrass, a species imported from faraway Siberia. And fields where men had tried dry farming and failed in a region of too little rainfall are blooming again with this hardy newcomer.

Reseeding methods are relatively simple and the overall costs moderate, considering the economic values created. Each area where revegetation is deemed feasible is treated as a unique problem. Success depends on knowing what species to seed, when to seed, and how to do it economically.

The first step is to appraise the site carefully. The better soils produce more grass; hence, with the same costs involved, greater re-

turns are realized by seeding the most fertile sites first. A dark friable soil, and the existence of humus and litter, are signs that seeding is apt to take. It does not matter if the area is densely covered with sagebrush—when this growth is removed the soil will support flourishing stands of grass.

One effective way of getting rid of the sagebrush is to burn it off. Fire, however, is a dangerous tool and requires adequate precautions. It should be used only on ranges where it will not jeopardize timber stands, or help start erosion or otherwise upset watershed values. After burning, the range should be immediately seeded in order to stabilize the soil and prevent undesirable plants from coming in.

On many successfully reseeded ranges the big job was to get rid of the sagebrush. Heavy offset disks and wheatland plows are perhaps the best machines for its elimination, although the Forest Service has designed a "brushland plow" which is giving superior service. The plows, in general, not only kill out the brush but prepare a good seedbed. Seed is sometimes broadcast behind the plow and is then covered by soil sloughing or by harrowing. If the brush is not too dense, the seed can be drilled in after the brush is torn out and the soil has been allowed to settle.

Airplane seeding has been tried successfully by the Forest Service on burned-over land in Montana and on depleted aspen range in the mountains of Utah. This is a relatively cheap method when used under special conditions that assure success. Expensive experiments with pelletized seed dropped by airplane, however, as tried by the Department of Interior at the request of Congress have been a dismal failure.

The Forest Service estimates that the average cost of seeding national forest land is from eight to ten dollars an acre. This includes the price of the seed, labor and construction of fences which not only keep out the livestock until the treated areas are ready for grazing but become part of the management plan for the range.

The proper time for planting is as important as the proper place—generally the season when the soil will remain reasonably moist and the temperature favors germination and sufficient growth to allow the plants to get a good start. In the intermountain valleys and foothills of the West, the soil is usually moist in winter and spring, while the summers are dry. Seed planted in the autumn is ready to germinate when the sun warms up in the spring. In the Southwest, with its dry spring and good summer rainfall, early summer planting has been most successful.

The type of species sown also influences the planting time. The "cool-season grasses," such as the

popular wheat-grasses, should be sown in the fall. "Warm-weather grasses," like the lovegrasses, on the other hand, may be killed by winter freezing. Likewise, legumes with their taproots are susceptible to frost heaving and the young seedlings are sensitive to freezing temperatures.

Ranges must be protected after seeding. In fact, one to three years are usually required before the plants are sufficiently established for livestock to graze them. Plants are regarded as strong enough to withstand grazing after they have produced a seed crop.

Reseeding has paid off on numerous areas. Many restored ranges have been grazed for ten years or more and continue to yield an abundance of forage. Some have been producing steadily for forty years.

W. R. Chapline, chief of the Division of Range Research of the U. S. Forest Service, states that "many an acre with very little actual grazing value but which might have sold for one dollar has, through reseeding that cost three to five dollars, increased ten or twelve dollars or more in value." Even at ten dollars an acre, he says successful reseeding "followed by good range management will provide very satisfactory returns."

The sustained forage production from reseeded crested wheatgrass has been demonstrated, for example, at the U. S. Range Livestock Experiment Station in Montana. Reseeded in 1936, a forty-six-acre range area enabled fourteen two-year-old steers to put on 318 pounds per head in ninety-eight days from April 22 to July 29, 1947. These steers were sold at twenty-five cents a pound, and averaged 1090 pounds, thus bringing $272 a head—a gross return for their gain of $24.25 an acre.

Nor are the increased meat production and enhanced land values the only benefit. The availability of more forage helps the livestock operator round out the feed supply, and fills a gap at critical periods of the year. In many parts of the West, where spring forage is scarce, ranges reseeded to crested wheatgrass can be used by livestock two or three weeks before the native range is ready. This makes it less necessary to feed hay or concentrates and insures ample milk for suckling calves or lambs.

A reseeded range is also a boon to the soil. The dense stands of new grasses help to counteract erosion and abate floods and dust storm damage.

Reseeding has proven feasible and practical in the West. But only the surface of the job has been scratched. About seventy-five million acres, including federal, state, and private lands, still need this kind of treatment if full use

is to be made of them.

Present techniques must be greatly enlarged to cope with this problem. There are still about sixty-seven million acres of western range for which we have not yet found proven practices. For these areas the right species or strains of plants must be discovered and effective methods of getting them established.

There are still many unanswered —or partly answered—questions. Hence research must be continued on a progressively larger scale. Our experiment stations are working steadily to reduce the unknown factors and find techniques which will make the depleted ranges bloom again.

"Break-Even" For Broilers

Condensed from Hatchery & Feed

Dr. George M. Briggs
University of Minnesota

MUCH has been written lately about high efficient or high energy rations for broilers. The emphasis in the development of such rations has been on increasing the efficiency of feed utilization and rate of growth. Until recently, however, not much headway has been made in producing high efficient feeds at a low cost.

The saving in money made pos-

Table 1—Cost of feed per pound of meat (live weight) produced, in relation to efficiency and cost per ton

Feed efficiency (pounds of feed to make a pound of broiler)	Cost of feed per pound of broiler meat produced when cost of a ton of feed is:								
	$60 ton	$65 ton	$70 ton	$75 ton	$80 ton	$85 ton	$90 ton	$95 ton	$100 ton
pounds	cents	cents	cents	cents	cents	cents	cents	cents	cents
2.4	7.2	7.8	8.4	9.0	9.6	10.2	10.8	11.4	12.0
2.6	7.8	8.5	9.1	9.8	10.4	11.1	11.7	12.4	13.0
2.8	8.4	9.1	9.8	10.5	11.2	11.9	12.6	13.3	14.0
3.0	9.0	9.8	10.5	11.3	12.0	12.8	13.5	14.3	15.0
3.2	9.6	10.4	11.2	12.0	12.8	13.6	14.4	15.2	16.0
3.4	10.2	11.1	11.9	12.8	13.6	14.5	15.3	16.2	17.0
3.6	10.8	11.7	12.6	13.5	14.4	15.3	16.2	17.1	18.0
3.8	11.4	12.4	13.3	14.3	15.2	16.2	17.1	18.1	19.0
4.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
4.2	12.6	13.7	14.7	15.8	16.8	17.9	18.9	20.0	21.0
4.4	13.2	14.8	15.4	16.5	17.6	18.7	19.8	20.9	22.0

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Mount Morris, Illinois, May 1950

sible with the use of more efficient feeds is still not fully appreciated. To show some of these interesting relationships between cost of feed and efficiency, Table 1 has been prepared. This gives the cost of feed necessary for each pound of broiler meat produced at various feed efficiency values and with rations at various prices. The table not only applies to broilers but to turkeys as well.

If the figures in Table 1 are studied, it soon becomes clear that the number of pounds of feed it takes to produce a pound of meat is just as important a factor in determining the feed cost of a pound of broiler meat as the actual selling price of the feed. For instance, *a feed costing $100 a ton can actually produce cheaper meat than a poor ration costing $70 a ton.*

It is evident from the table, for example, that a producer could afford to pay approximately $5 more for each ton of feed for every 0.2 of a pound improvement in feed efficiency; or up to $25 more for every pound improvement, etc. The actual cost of a pound of meat would be the same or less with the more expensive feed in each case.

On the other hand, it is very evident that a *good, efficient* low-cost ration (and they are possible today) has a big advantage over a high-cost ration. For example, a ration selling for $70 a ton which gave a feed efficiency of 3.0 would be more profitable to the producer than most any $90 ration that it is possible to make today. Also, it is clear that a ration selling, for example, at $90 a ton with a feed efficiency value of 3.4 or more is out of the running in the race for profitable feeds today. This is assuming, of course, in all these examples, that the length of time to get the bird to market weight is the same in each case. As a general rule, it is true that the most efficient feeds will give the fastest growth rate. Rate of growth, however, is not as important in farm flocks as it is in a commercial broiler flock.

The selling price of a pound of broiler meat necessary for the producer to "break even" is dependent on many factors, of which the cost of feed is the largest. It is well known that approximately 50 to 60 percent of the total cost of producing a pound of meat is feed.

The "break-even" point for broilers today is approximately 24 to 25 cents per pound in the Delmarva area according to figures recently released. Actual selling prices are not much above this. This doesn't leave much room for profit unless reasonably priced high-efficient feeds are used.

In Table 2, figures are given for the return over feed costs for each $100 spent on feed in relation to feed efficiency and cost of feeds, calculated on the basis of a 25 cents per pound selling price of

broilers (and assuming other factors are about equal).

It can be seen from the table how important feed efficiency and cost of feed are to the "return over feed costs." For example, if broilers are selling at 25 cents, the use of a $90 a ton ration with a feed efficiency value of 3.0 would only leave $85 after deduction of each $100 spent for feed. This is not enough return to make a profit for the producer at this selling price. However, it is evident that the same feed selling for $80 or less a ton, *or a more efficient feed,* would produce a profit for the producer. Also, a larger selling price would increase the return.

The "break-even" point, therefore, is very much dependent on feed prices and efficiency. It can be reduced considerably (also see Table 1)—down to as low as 20 cents or less—when good low-cost feeds, or very highly efficient, reasonably priced feeds, are available.

Here at Minnesota, we have been attempting to formulate low-cost rations that could return more money to the producer than available higher priced rations. In the Midwest, there is an abundance of corn, much of which is home-grown, and rations built around corn as the chief cereal are logical. Considerable soybean oil meal is also obtainable and now, with the availability of vitamin B_{12}, more of this protein can be used. Rations built largely of corn and soybean oil meal have been studied in many laboratories, especially at Purdue, Illinois, Texas, Beltsville, Idaho, and elsewhere.

It is now known that it is possible to raise normal started chicks and broilers with high energy and efficient rations containing *no animal protein.* These rations are just as effective as older style high-fiber rations containing animal products. They do not, as yet, give quite as fast growth rates as the best Connecticut-type rations, but they are low in cost. The importance of this is that it shows the extremes that are possible with practical poultry rations. The final choice in deciding between animal or plant protein feeds now depends largely on price relationships. Animal products are still being used in most commercial rations, but it is clear that lower amounts are possible than before, in the presence of vitamin B_{12} concentrates.

In our experiments, the following all-plant ration has been used with success. (We call it the simplified University of Minnesota broiler mash.) Each ton of ration contains: corn (finely ground) 1200 pounds, good quality soybean oil meal 700 pounds, bone meal or equivalent 50 pounds, oyster shell or limestone 30 pounds, iodized salt 20 pounds, 400D-3000A feeding oil 4 pounds, and manganese sulfate 0.6 pounds. Each ton also contains riboflavin,

3 grams, and vitamin B_{12} 15 milligrams. Any concentrate of riboflavin and vitamin B_{12} may be used provided this amount is supplied. For example, we use 14 pounds per ton of a riboflavin concentrate containing 227 milligrams per pound and 1.2 pounds of a vitamin B_{12} concentrate with 12.5 milligrams of B_{12} per pound. Other products with different potencies are also available that are just as effective.

This palatable ration has given very good results in White Leghorn and heavy breed chicks, as long as the ration is mixed carefully and as long as none of the ingredients is omitted. (It is important to use finely ground corn to prevent small chicks from picking out the corn particles.)

For instance, a group of 100 White Leghorn chicks, mixed sexes, weighed an average of 2.7 pounds at 12 weeks of age when fed the corn-soybean ration with added B_{12}. A similar group fed our usual Minnesota starting mash weighed only 2.5 pounds at the same time. It took only 2.7 pounds of feed to make a pound of gain on the simplified ration as compared with 4.1 pounds of feed for the regular starter ration. These birds have been raised to maturity and gave good egg production on a similar ration, which is in the experimental stage at present.

A small group of crossbred chicks (both sexes) fed this same ration weighed 2.4 pounds at 9 weeks and ate 2.50 pounds of feed for each pound of meat. In addition, this ration has been used successfully on New Hampshire broiler flocks in the St. Paul area and elsewhere. Fish meal, milk, meat scraps, dried fish solubles, and many other products are being used instead of the vitamin B_{12} concentrate with equal results.

At today's prices here in the Midwest, the above ration can be locally mixed by small feed mixers at about $70 to $75 a ton, or less, including bags and mark-up. Various modifications of the ration are possible, of course, such as the addition of small amounts of animal products, without much additional cost.

We feel that still further improvement can be made in this ration, and it is certainly not claimed that it will give as good results as all broiler feeds on the market today. More important, it shows what can be done today with the availability of vitamin B_{12}.

Concentrated APF supplements are available today so that enough for a ton of feed (about 12 milligrams) costs very little. These should be premixed with other concentrates before mixing, for good dispersion in a mash.

A number of vitamin distributors are now selling special multivitamin supplements containing not only vitamin B_{12} but also many

other important vitamins, especially riboflavin and vitamins A and D. These concentrates are very useful to the small mixer who has difficulty in getting the individual ingredients or who would rather not stock each individual vitamin. Many good concentrates of this nature are available, and they have the advantage of having the vitamins premixed in proper amounts for easy mixing. In addition they usually contain several of the "minor" vitamins. These concentrates vary in potency and price, and it is up to the feed mixer to compare unit values and cost of the "extra values" present with those obtainable elsewhere.

The feed mixer should not expect miracles from low-cost all-plant rations or from vitamin B_{12}. If in doubt about any new type of ration, we strongly recommend that the feed man get a trial run made in his own area by cooperating with a local producer. Compare any radically new ration with one that has given good results under local conditions to be sure.

There are many ways to save money in raising broilers, including the use of better and more efficient strains of chickens, the use of labor-saving devices, the use of better management practices, the prevention of loss from disease and mortality, the development of better markets, and, last but not least, the reduction of feed costs. Feed costs can be lowered by using better and more efficient feeds, by cheaper good-quality ingredients, by "bulk" feeds, by reduction of overhead, and by simplification of mixing operations.

Table 2—Return over feed costs for each $100 spent on feed in relation to feed efficiency and cost of feed*

Feed efficiency (pounds of feed to make a pound of meat)	Return over feed costs for each $100 spent on feed (if meat sold at 25 cents per pound) when cost of a ton of feed is:								
	$60 ton	$65 ton	$70 ton	$75 ton	$80 ton	$85 ton	$90 ton	$95 ton	$100 ton
pounds	$	$	$	$	$	$	$	$	$
2.6	221	196	175	156	141	126	114	103	92
3.0	178	156	138	122	108	96	85	76	67
3.4	145	126	110	96	84	73	63	55	47
3.8	119	103	88	76	65	55	46	39	32
4.0	108	92	79	67	56	47	39	32	25
4.2	99	83	70	59	49	40	32	25	19

(* Calculated on basis of selling price of meat at 25 cents per pound)
To calculate the return at any other selling price per pound of chicken meat, add $100 to the above figure, multiply the sum by the new selling price, divide by 25 and subtract $100.

Building of Masonry?

Condensed from Poultry Tribune

W. C. Krueger
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A TRIP across the country should convince anyone of the acceptance of masonry construction for poultry houses. From New Jersey to California and circling back, I have seen these houses dot the landscape.

My impression is that much of this has been new construction. It includes all types of masonry—concrete or cinder blocks, tile, brick, and even stone construction.

It is interesting to note the various reasons farmers and poultrymen have given for this decided shift from frame to masonry construction. One old-time poultryman said, "I wanted to get rid of rats and mice around the place. I was tired of patching walls and it took too long to do a good job of cleaning-up with so much wood framing sticking around."

Another stressed the low maintenance costs of a house that did not require painting or the replacement of rotted sills and framing. I suspect that the high price and scarcity of lumber has given impetus to the movement, for several have stressed the lower cost of masonry construction and the fact that they can build the houses themselves, as time permits. Here and there an owner has recognized the fire resistance value of masonry construction. Owners of well constructed masonry houses also stress their summer coolness.

Although poultrymen may differ as to why they built their new laying houses of masonry—they generally agree regarding satisfactory performance. Those who contemplate building always ask the same question, express the common doubt—"Aren't masonry houses damp?"—"How do you keep the walls dry?"

The answer lies in treating the outside wall surface to prevent rain from soaking the blocks. There also must be a ventilation system which will keep the humidity inside the house low enough so that moisture will not condense on the inside wall surfaces.

A masonry house can be unsatisfactory if certain niceties of detail in constuction are overlooked. Masons and contractors often fail

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to appreciate this from lack of experience.

Starting with the foundation, let's go over some of these essentials. We can't afford to risk settling and cracking of a heavy masonry wall and so the foundation footing should be of poured concrete, extending at least to the normal frost line. It must be wide enough to get firm soil support. A common width is 14 to 16 inches and depth, 8 to 10 inches.

In most cases, it is easier to bring the poured foundation wall to above the grade level, making it 10 to 12 inches wide; or one can start the masonry wall directly on the footing. Over filled soils, the footing may have to be reinforced to avoid differential settling.

A tile drain the length of the house along the footing ledge will intercept water moving down the slope before it gets under the house and so will help keep the floor warm and dry.

It is usually easier to lay the floor down after the foundation and partition walls are up. Where available, cinders are used for fill but coarse gravel or crushed stone will do as well.

In cold climates, there may be some virtue in casting the concrete floor directly on the earth in order to take advantage of ground warmth. In this case particularly, pouring the concrete floor in two courses and placing a moisture barrier of mopped asphalt or well-lapped asphalt-saturated paper between them is good insurance against any possible upward movement of ground moisture into the litter. A sheet of moisture resistant insulation material between the floor edges and the outside walls will help a lot to prevent conduction of cold from walls to floor.

In masonry multi-story construction, one should stiffen the walls by the use of pilasters at convenient intervals of about 12 feet. Partitions of masonry, if keyed into the wall, effectively brace the building.

Exterior doors should open outward. Cast the floor as a continuation over the wall to form the door sill. Notch the edge with sloping form board so the door rests against the floor edge instead of sliding over it. This prevents sticking due to ice or swelling.

A construction detail often overlooked is fastening the girder support posts to their footing piers with iron straps or bolts. Post-to-girder connections must also be well spiked or preferably joined by metal fasteners.

When laying up the rear wall, don't overlook the possibility of incorporating roost hinge supports. These can be made of quarter-inch rod, bent into "U" shape and laid in a mortar joint at roost support height, leaving a half inch or so of the loop exposed. The

free leaf of the roost hinge drops behind the loop, permits free action yet enables one to lift the 10′ roost sections off for scrubbing and sunning without use of screwdriver. This also saves the cost of a 2 × 4 against the wall, and it can be used for either pit or dropping-board roosts.

Wall insulation is desirable in colder climates. An eight-inch wall of clay tile or cinder block has about the same value as a wall of one-half inch insulation board over paper and studs. Walls having core holes can be handled by filling the holes with granular insulation. This is said to double the value of such a wall, but the material must be kept dry to be effective. Structural insulation board also can be nailed on furring strips.

To rainproof a masonry wall of porous material, first dampen the surface, then apply a seal coat made of 60 pounds of Portland Cement paint powder and up to half that weight of clean sand or fine limestone grit. This is mixed to creamy consistency and is scrubbed into the dampened surface with a stiff brush. As soon as the paint is set enough so that it will not wash off, keep the wall wet for a 24-hour curing period. Follow this with a finish coat of the paint powder, water mixed, applied with a white-wash brush, and cured as before.

Builders often neglect to bolt the rafter plates to the wall. Such ties should be placed no more than 10 feet apart and also at the ends of the plate lengths. Bolts should be long enough to reach into the second course of masonry below, and must be grouted in place. Setting the plate on soft mortar makes a tight seal and prevents air leaks. Metal fasteners are now available to firmly tie rafter and plate together, a much stronger joint than toe-nailing.

Where a wall continues over window or door openings a lintel is necessary to carry the load across. Iron beams or doubled angle irons can be used but the more common practice is to use beams of precast reinforced concrete. These will not show rust streaks and blend well with the wall surface. Such lintels can be cast in place. This, however, takes forms that are hard to hold in place and pouring is awkward.

Single sash windows that slide open vertically are traditional in poultry house construction. Double hung sash cost more, take more framing, open only half their area. In masonry construction, it is easiest to slide the windows outside the wall. The sill is flush with the wall surface, while the header projects enough to lap the window top. Vertical strips screwed into mortar joint plugs or nailed into the blocks serve as guides.

Windows are supported by sash cord through pulleys on the plate

and balanced with sash weights. Or they can be adjusted by having the cord wound around a pipe supported lengthwise the house and fitted with a winding crank.

Rear wall windows are necessary for light and particularly for cross ventilation in hot weather. Cellar sash are often used, placed below the dropping board or directly underneath the wall plate in the case of dropping pit roosts.

The subject of poultry house ventilation is usually good for an argument whenever the experts get together. Some claim that adjusting the windows gives enough air exchange to prevent litter trouble. Some combine window control and top front outtake openings. A few poultrymen have made ventilation independent of whims of wind and weather by using electric fans, thermostatically controlled.

In houses of moderate width, however, the so-called slot ventilation, gravity flow system has been quite satisfactory. In this system, air is admitted through the front wall near the floor level, passed upward in the wall enclosure and enters the room at window sill level. Adjustable openings in the front wall between the rafters or joists, or immediately beneath the plate, serve as exhaust or outtake ports.

The problem of bringing air in through a masonry wall is solved by the use of the core holes as vertical ducts. By using a course of blocks half normal thickness at the floor line the holes in the block above can be exposed to the outside. Similarly, such a course at window sill level can expose the openings to the inside of the house. This serves as a baffle to prevent direct entry of winds at floor level. The air is exhausted at ceiling level through the front of the house.

Rear wall ventilation is not recommended in conjunction with the slot ventilation system.

Insulation of the roof is a construction requirement common to both frame and masonry houses. The value of the insulation used should exceed that of the walls. This is to insure that accidental condensation will be directed to the walls instead of causing ceiling drip and rot. When ceiling and roof are combined, as in flat roof construction, insulation is usually applied over the rafters in the form of structural insulation board. Some form of vapor seal is necessary between the room surface and the insulation. This is true also where fill type insulation is used between the rafters. Vapor sealing must be lapped on structural members to make an air-tight job.

The Rumen Activity of the Cow

Condensed from Certified Milk

Gustave Bohstedt, Ph.D.
University of Wisconsin

If it were not for cattle and other ruminants, we could make very little use of the more than 500 million acres that are in pasture in the United States, besides 90 million acres that are in hay, silage, or other forage crops. Besides this, there are the vast areas of grazing lands in the national forests and other public domains.

The organ that makes it possible for this great tonnage of high fiber forage crops to be converted into the finest human foods, meat and milk, is the compound stomach arrangement at the lower end of the esophagus, the rumen, reticulum, omasum, and abomasum, but particularly the rumen or paunch that is designated the first of the four compound stomachs. This compartmentized stomach in a mature cow has a capacity of about 60 gallons. Single-stomached animals like pigs, poultry, dogs, or man, would be unable to make much use of grass directly. Nor do ruminants themselves secrete any digestive enzymes that attack fiber or cellulose material in the forage that is eaten. Digestion of cellulose and a lot of other tasks are performed for them by an ingenious arrangement of nature in ruminants or polygastric animals.

Research work during recent years has revealed more and more about this paunch and associated compartments of a cow, and the accumulated findings are really astounding. Instead of being merely a storage organ for soaking roughage until this is ready to be regurgitated for chewing the "cud," a really amazing lot of digestive and synthetic activities is going on in the paunch.

Domestic ruminants are not the only ones that have this wonderful adaptation of nature, for besides the cow, sheep, and goat, we have the deer, buffalo, camel, llama, reindeer, and other ruminants. Cattle, or cows especially, have been domesticated and have been made more efficient in the conversion of forage into meat and milk.

After 12 to 24 hours' presence in the paunch, a more or less selective reflex action delivers back to the mouth a bolus or cud of previously swallowed forage which after leisurely and fairly thorough masti-

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cation, lasting about one minute, is swallowed for the second time. It is thereupon rather quickly expedited to the second, third, and fourth stomachs. During its previous presence in the rumen the contents, which are of a rather sloppy consistency, have been churned and agitated by the peristaltic contraction and expansions of the paunch, which peristalsis is characteristic of the digestive tract from one end to the other. One of the major purposes of this movement obviously is the thorough mixing of the contents so that all portions are exposed to the biological or enzymatic activity that is going on in the contents of the digestive tract. It also helps the rumen bacteria in that it tears down partly digested fiber for further digestive action. The nutrients so produced serve as food for these organisms that one might think of as being "fattened."

A large part of the liquid in the paunch is saliva of which a cow produces about 125 pounds per day. A characteristic of this saliva is that it is on the alkaline side, having pH 8.2 which seems necessary to make for the proper conditions in the paunch. The tremendous amount of saliva secreted contains from two-thirds to three-fourths pound of sodium bicarbonate. Without this alkalizing material the chemical reaction of the paunch would on account of the predominance of carbohydrates in the paunch, be acid, and would not be favorable for the microorganisms that inhabit this "fermentation vat." Saliva also has a lubricating function and maintains a proper moisture relationship in the paunch.

In the rumen activity gases are produced, principally carbon dioxide and methane, that account for a loss of about 11 per cent of the total energy of the forage eaten. This in view of the benefits of digestion obtained is not a severe loss. The gases are eliminated through eruction, making use of the esophageal slit at the entrance to the rumen. In case the slit becomes clogged, bloat results which requires prompt treatment in order to save the animal.

It is the enormous number of microorganisms in the paunch that converts high fiber forages into digestible nutrients and into synthetic nutrients that are the result of rumen activities. The major organisms are bacteria and protozoa. There are present also different kinds of yeasts, molds, and actinomycetes. For the most part, these seem to have been introduced on the surfaces of the roughages that are eaten and probably do not have any specific purpose in the rumen. Not so, however, in the case of the bacteria and the protozoa. These are very active, indeed, in the essential functions of the rumen.

The conditions for the growth

and activity of these microorganisms are a chemical reaction just below pH 7 in the case of cattle, and a balanced food supply in the presence of suitable moisture and anaerobic conditions at body temperature. Bacteria need their own balanced rations in a somewhat similar manner as cows or other animals need such ratios or proportions of proteins, carbohydrates, seemingly also certain minerals and perhaps vitamins. Different investigators including Dr. C. F. Huffman of Michigan State College have done considerable work in studying rumen activity of cows. Every year or two it seems still another favorable activity is being demonstrated.

The relationship of rumen microorganisms to the host animal, the cow, is a beautiful example of symbiosis, which means a mutually helpful relationship. Professor E. G. Hastings of the University of Wisconsin, having looked closely into the various ramifications of rumen activity, made this significant statement: "If it is at all possible to arrange the symbiotic relations between mammals and their micro-associates in the order of their relative importance to man, it is certain that those between the ruminants and the microorganisms would rank first." In this connection let us again think of the millions of tons of roughage that largely through the function of these microorganisms, are converted into the wonderful nutritionally protective food that we have by way of meat and milk.

While there are therefore many different kinds of microorganisms in the paunch, the two most important ones are bacteria and protozoa. Of the two, the bacterial action seems to be at least initially the more important in that through the enzymes which they secrete they break down the fiber or cellulose of roughages, converting this into simpler, more digestible carbohydrates. The latter are in large part organic acids, prominently acetic, propionic, and butyric acids. It has been computed that a cow during the course of a day produces three-fourths of a pound of acetic acid.

This fatty acid production has suggested to some investigators that the paunch of a cow might be the seat of butterfat formation. A good bit of support to this theory is lent by the observations in various experiments that when normal rumen fermentation is interfered with, as by feeding a cow ground hay instead of long or chopped hay, or by feeding her pelleted hay and grain, or a very small proportion of roughage to grain, then the butterfat percentage of the cow's milk is greatly reduced. It has been found that cows that might produce from three and one-half to four per cent butterfat would after getting for some weeks a highly compacted ground or pelleted ra-

tion, have a butterfat percentage of two per cent or less. Nature obviously intended a ruminant to have a certain amount of bulky fibrous feed for best functioning of the rumen and for a best mutual relationship of the host animal and the microorganisms in that part of the digestive tract.

When about three weeks of age a calf starts ruminating or chewing its cud. By that time it has come to eat small amounts of hay along with its grain mixture and milk. There is still a question as to whether the rumen of such a young animal can take over all the functions of a rumen in a mature animal. In other words, are the microorganisms the same in a month-old calf as they are in a two- or three-year-old cow? A beef calf that runs with its dam for many months and that licks a lot of the material that mature animals are slobbering over, has every chance of having its paunch inoculated with suitable organisms. There need be little worry, therefore, about a beef calf being a normal ruminant as soon as nature permits.

On the other hand, a dairy calf is removed from its dam when only two or three days of age. After that it is not in contact with the dam or other cows, nor is it in contact with feeds or feeding equipment that in the case of the beef calf constitutes the agent for inoculation. With this in mind, Ohio Experiment Station investigators have transferred "wads" of rumen contents of cows to the rumen of very young calves, to see how this affects the character or efficiency of rumen activity. We may hear one of these days what the results are.

While horses and rabbits do not have a rumen, they do have a caecum which is located in the region of the appendix and constitutes the juncture between the small and the large intestine. These animals are obliged to chew their forage in the original state, in many cases in a dried state, rather than as a cow when the material is greatly softened and partly broken down through a day's presence in the rumen. Caecal digestion then takes place only after the normal digestive juices of the stomach and small intestines have had a chance to act upon the fibrous feed, with the result that, where the bacteria lack the full complement of various nutrients, not as efficient digestion of fiber or cellulose takes place in these animals as in ruminants. The caecum, therefore, is a compromise between ruminants and monogastric animals like the pig and the chicken.

There are various forms of cellulose, some of them being of the kind that we have in the thin cell walls in leaves of forage crops or in beet pulp and in still other "lacy" kinds of cellulose. Even

monogastric animals are fairly efficient in digesting this kind of cellulose which is almost like starch. But as forage crops mature, their cellulose, particularly in the stemmy portions of the plant, become thick and lignified. Lignin is extremely hard to digest. It makes for a woody condition in the plant. Lignin has been compared to a cement that holds plant cells together.

Here is where rumen bacteria face their stiffest task, and they are working under severe limitations if they do not have at least a small amount of readily fermented carbohydrate along with such roughage to furnish them the necessary energy for their various activities. Starch has been found better than molasses or sugar, probably because it was not passed on so quickly into the true stomach, but remains longer as a source of energy.

There has in recent years sprung up a considerable interest in the feeding value of ground corn cobs for cattle and other livestock. Corn cobs have even more fiber (32%) than has hay (28%), let alone leaves like alfalfa leaves (14%), or barley (6%), or corn (2%). So bacteria need at least a minimum of readily available carbohydrates to work most efficiently. It is a case of feeding the bacteria to feed the cow. Also a minimum necessary amount of nitrogen or protein is required by them.

In some extensive corn cob feeding experiments where cobs made up the bulk of the ration, the addition of some corn and molasses was necessary for best results, especially where urea was to serve as a protein substitute. If, as in some Wisconsin experiments, urea was fed simply with timothy hay but no grain, there was poor utilization of the urea; with grain, utilization was satisfactory.

While high fiber feeds like coarse hay or corn cobs, therefore, can be utilized, they are, after all, low energy feeds and need to be fed with discretion, especially in the case of growing, fattening, or high producing animals. One needs to recognize the limitations of the ability of microorganisms to tear apart the really tough kinds of cellulose which have been designated lignified cellulose.

What dairymen should be concerned about is the quality of the roughage or forage, meaning that it should be leafy and green, of good odor or aroma, and should be nutritious and palatable. Forage of that sort, whether pasture, hay, or silage, is much higher in energy than stemmy or coarse forage, and enables the cow in large part to dispense with grains or concentrates. When, therefore, the many nutrients supplied by leafy green forage are available to the microorganisms of the paunch, they are

in that way, along with their host, provided with a "balanced ration."

Because of the ability of paunch microorganisms to utilize one-sided proteins or even inorganic nitrogen, we do not need to worry about high quality proteins or a great variety of proteins in rations for dairy cows. By high quality protein we mean, of course, the presence in proper proportions of all 22 amino acids that make up a good protein such as we have in fish, meat, milk and eggs.

Bacteria seem to have the ability to convert inorganic nitrogen such as is present in urea, for building their own body protein. From the standpoint of protein quality, therefore, ruminants are easy to feed. One does not need to feed cows any fish meal, meat scraps, tankage, or other high-quality protein concentrates. This is, indeed, a very high tribute to the rumen flora and fauna.

For cows capable of high milk production it takes grain to supplement the forage feeds. Then the question, is it necessary to be very particular about the quality of protein? Wisconsin and Cornell University experiments have abundantly demonstrated that a simple one-sided kind of protein and even urea, which is not even a protein, serves the purpose. Just so there is a minimum necessary amount of actual protein, then the rest of the necessary protein can be manufactured from such a simple compound as urea, which is essentially a nitrogen compound. It has frequently been used as a fertilizer.

Recent work at Cornell University has shown that rumen organisms have been able to synthesize all of the ten essential amino acids from urea alone. Not that this necessarily means that urea can afford to be the only source of potential protein in the ration. But it does show that the paunch organisms are remarkably effective in their conversion of simple nitrogen or simple protein into highly efficient and complete protein.

In addition to breaking down crude fiber and in turn, building up good protein, paunch organisms have been demonstrated as able to synthesize a long string of B-vitamins, starting with thiamin, riboflavin, niacin, pantothenic acid, etc., and at this date, ending up with vitamin B_{12}. It is suspected that a cow or sheep by virtue of its rumen can synthesize the entire galaxy of the vitamin B complex. Where pigs and chickens need to be supplied a number of these vitamins to a greater or lesser extent along with their normal concentrates, the cow is happily able to build these up for herself through the agency of that "fermentation vat."

It seems that the cow is intimately dependent upon this source of supply of these essential vita-

mins. If her rumen contents were all at once removed, she would suffer a terrific shock from this deprivation of essential protective nutrients and would be apt to die. In an experiment conducted by Dr. C. F. Huffman and associates they were able to save the life of a cow by using steer paunch contents obtained from a nearby slaughterhouse, to take the place of the removed material in the paunch of the cow.

While cows and other ruminants have need of many vitamins, including especially carotene or provitamin A and other fat-soluble vitamins, it would under normal conditions be carrying coals to Newcastle to feed them B-complex vitamins. They would not thank the donor as might pigs, chicks, very young dairy calves, and other so-called critical animals.

Poultry investigators have come to identify the presence of hormones in cow manure and paunch manure. One such hormone extracted from cow manure is a male hormone which when fed to chickens greatly intensifies the color of combs and wattles. There is still some debate as to whether this is merely a concentration of the hormones in question from the forages that are eaten, or whether it amounts to a true synthesis within their paunch. There is an inclination to believe that it is a case of true hormone synthesis. Certainly, in view of the many other syntheses that are taking place in that organ, it would not be straining one's imagination to think that rumen fermentations were also capable of building up hormones.

While the bacteria have been the major actors so far in this discussion, the protozoa appear to play a very important part. There is a theory that the bacteria do most of the work of breaking down cellulose and synthesizing proteins and vitamins, but that protozoa ultimately make the bacterial mass available to the host animal—after the protozoa have eaten and digested the bacteria. It is thought that bacteria themselves are not as digestible for the cow as are the larger one-celled animals, the protozoa. There is reason for this assumption in that after a cow has eaten a meal, the number of bacteria in her paunch greatly increases. Only thereafter the protozoa likewise greatly increase in number, as if in response to the increase in their food supply as furnished by the bacteria. This has suggested that the cow gets her fine proteins and vitamins third-hand instead of second-hand.

It has been estimated that there are from one-half to one billion protozoa in a cubic centimeter of rumen liquids, and that they make up five per cent of the volume and 20 per cent of the dry matter of rumen contents. Certainly such a mass is of enormous importance to the cow. The rumen liquids con-

taining the organisms and the feeds in suspension and solution are constantly being advanced to the true stomach and intestines for digestion. The cow benefits very intimately from this food supply, and it would seem certain that her milk is enriched with vitamins as a result of this kind of symbiosis. Thus it has been shown by Wisconsin workers that beef is twice as rich in vitamin B_{12}, discussed in the following paragraphs, as is pork.

Another interesting light is shed upon rumen synthesis through a study of cobalt in ruminant nutrition, this being one of the minor or trace mineral elements. Cobalt makes up about four per cent of the molecular weight of vitamin B_{12}, which has been mentioned before as being capable of synthesis in the paunch. In order to enable organisms to manufacture B_{12}, therefore, cobalt needs to be present in the feed or in the paunch contents. It seems that cobalt and perhaps still other minerals, including trace minerals, are necessary for the welfare or efficiency of the microbiology of the paunch. Where cobalt was lacking in some University of Wisconsin experiments with sheep, there was little vitamin B_{12} in the paunch. When cobalt was added there was a greatly increased production of this vitamin.

If cobalt was injected in the bloodstream of a cobalt-deficient ruminant, there was little or no response. Cobalt had to be fed by mouth. Pigs and other monogastric animals apparently do not need cobalt, but they definitely need vitamin B_{12}, or for that matter, the "animal protein factor" which is vitamin B_{12} plus apparently one or more additional vitamins. It seems from recent experiments that in APF produced by biosyntheses, some aureomycin likewise is present in this material, thus accounting for some striking improvement in the growth of laboratory animals and pigs.

Enough to suggest that in the rumen of a cow we have a most wonderful laboratory, the functions and possibilities of which have become appreciated in relatively recent years and even months. Governor William Dempster Hoard in his day referred to the inside of a cow as the darkest place on earth. There are still many mysteries wrapped up inside her hide, but gradually more and more light is shed upon this spot, and certainly one of the most interesting revelations is that of rumen activity.

Food Freezers For Every Farm

Condensed from Electricity on the Farm

P. T. Montfort
A. & M. College of Texas

A farm family of five, making full use of frozen foods, will need some 1500 to 2000 pounds of frozen meats, poultry, dairy products, fruits, and vegetables for the yearly food supply. This includes some for extra laborers, neighbors who drop in, and for visiting "city cousins." This family will need at least 25 to 30 cu ft of "zero" storage space. Facilities for chilling at 35° to 38° will also be needed to remove the animal heat from freshly dressed meat and poultry, and for holding fruits and vegetables from the time they are harvested until ready for freezing. After the food is processed into convenient sized packages, low temperatures (0° or below) must be available to freeze it as quickly as possible.

Some eighty-five manufacturers now make more than a hundred different types and sizes of refrigerators incorporating "freezer" space. The amount of such space in individual units varies from about 1 cu ft in the freezer compartment of the standard household refrigerators, to a thousand or more cubic feet in the large walk-in units.

There are more than eleven thousand frozen food locker plants in the United States, with close to five million individual boxes of 6 cu ft or larger. This is an average of almost four plants with 450 lockers each for every county in the country. Approximately 75 per cent of these plants are located in communities of less than 5000 population. The majority of these plants offer complete meat processing facilities—butchering, chilling, cutting, wrapping, and storage. All provide for freezing and storing fruits and vegetables. Many provide a convenient source for the purchase of all types of frozen foods not produced on the farm.

Single-Compartment Freezers: The reach-in single compartment freezers are usually of the chest or "lift top" type and are available in sizes ranging from 3½ cu ft to 40 cu ft with storage capacities of 120 to 1400 lbs of frozen food. These freezers are designed to operate at approximately 0°. They are also designed primarily for frozen food storage, with a relatively small capacity for freezing.

The large walk-in single-com-

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New York, N. Y., June–July, 1950

partment freezers are available in sizes from 120 to 1000 cu ft, or more. These large units are used primarily on large farms or estates, and on farms selling dressed poultry or other frozen foods.

Multiple-Compartment Freezers: The multiple-compartment, or 2-temperature freezers, may be either the chest type or the upright, front opening type. They are available in sizes from about 4 cu ft to 40 cu ft. In the chest type, one compartment, usually 2 to 6 cu ft, is designed for fast freezing. In the upright types the fast freezing may be done in a special compartment, or on the shelves which contain the refrigeration coils.

The large walk-in freezers, on farms selling frozen products, may have a special compartment operated at temperatures of −10° to -20° for "fast" freezing.

Dual-Temperature Refrigerators: As interest in the use of frozen foods has grown, the manufacturers of standard household refrigerators have increased the size of the "ice making," or freezer compartments, to provide more space for the storage of frozen foods. These larger freezer compartments are usually 1 to 2½ cu ft in size. Several manufacturers now provide separate doors for these compartments. This space provides for the storage of an assortment of foods convenient to the homemaker at all times.

The large reach-in dual-temperature refrigerators are available in sizes from 14 to 40 cu ft, or more. The freezer compartment may be from 30 to 50 per cent of the total capacity. Some of these refrigerators have two compressor units, one for each compartment.

At least 12 to 15 manufacturers are now making all-purpose refrigerators. The above-freezing sections of these refrigerators are of the walk-in type in sizes from 125 to 1000 cu ft, or more. The freezer compartments may be either reach-in or walk-in. In some units the freezer door, or doors, open from the chill room. In others, the doors to the freezers are from the outside.

The all-purpose refrigerator provides complete refrigeration facilities for all farm needs. The chill room maintains the desirable conditions for removing animal heat from freshly dressed carcasses or poultry, and for the short-time storage of perishable products, such as eggs, dairy products, dressed meats and poultry, fruits, and vegetables. The freezer compartment has ample capacity for freezing and storing all products needed for the farm food supply.

The all-purpose farm refrigerator may be used to increase farm income through more orderly marketing of perishable produce, or through the sale of "specialty" frozen products.

Table 1 shows the approximate cost of single- and multiple-compartment food freezers in sizes ranging from 4 to 24 cu ft.

As would be expected, cost increases with size. However, the cost per cu ft of storage space decreases as the size of the box increases.

The first cost of the all-purpose refrigerators, with walk-in chill room and reach-in or walk-in freezers, is still comparatively high, primarily because of the small number sold at the present time. The cost of these refrigerators will vary from about $1400 for a unit with a 125 cu ft chill room and a 35 cu ft freezer, to several thousand dollars for the larger units. On a cubic foot basis, this cost will be from about $11 in the smaller units down to about $3.50 in the larger ones.

Table 1—Freezer Chest Prices*

Size (Cu ft)	Average Price	Cost per cu ft
4	$232	$58
6	244	41
8	312	39
10	356	36
16	508	32
24	678	28

* From "List" Prices published by twenty manufacturers.

The cost of operating food freezers will depend upon (1) the size of the box, (2) location on the farm, (3) kind and thickness of insulation. (4) amount of food frozen, (5) section of the country, (6) number of times door is opened, and (7) special uses, such as making ice. Of these , size location, and insulation are the most important.

More than 90 per cent of the refrigeration "load" to be removed by the compressor is heat passing through the walls of the freezer from the outside air to the cold interior. Therefore, the larger the box, the more wall surface area and the greater the total cost of operation. It must be remembered, however, that the inward heat leakage does not go up in direct proportion to the size of the box. Heat leakage into a 12 cu ft freezer is approximately one and one-half times that into a 6 cu ft box having the same insulation, and the leakage through the walls of a 24 cu ft box is only about two and one-third times that of the 6 cu ft unit.

Temperature conditions surrounding the freezer chest will have a direct bearing on the cost of operation. The compressor and condenser units on food freezers are of the "air cooled" type. The efficiency of these machines decreases rapidly as the temperature of the surrounding air increases. If the freezer is located so that the compressor compartment is too close to adjacent walls, cabinets, or furniture, air circulation around the condenser will be reduced and the temperature will increase rapidly. This will cause higher operating cost.

If the refrigerator is located where the sun shines on it for

several hours during the day (as on a porch) the heat leakage into the box will be increased and the refrigerating machinery will have to operate longer hours. From the standpoint of *operating cost,* a basement is probably the ideal location for a freezer, since temperatures are more uniform and usually lower than in the house or other building. Before selecting the basement, however, one should consider the inconvenience of climbing stairs, and the more rapid depreciation of metal parts in some climates.

The insulating materials in the walls of freezer chests are poor conductors of heat. The quality of the insulation and the thickness determine the amount of heat passing from the outside air to the cold interior. The materials in common use do not vary greatly in the "conductivity" factor, so the effectiveness of the insulation is determined largely by the thickness. Four inches of "cork equivalent" insulation will transmit approximately one-half as much heat as two inches.

If the amount of insulation was considered in relation to operating cost only, it would be economical to use considerably more than is now common practice. The thickness of insulation (usually 4 to 5 inches) ordinarily used by food freezer manufacturers is the result of a "balance" between operating cost and first cost.

Feeding Hogs For Profit

Condensed from Hog Breeder

How do hogs fit into an individual farmer's program? There's no cut and dried answer to this question. A hog production program can be varied to fit the individual farm plan—depending upon the labor, equipment and management the farmer has available.

Hogs are efficient at converting feed into meat. Feed records of the Iowa Farm Business Association members show that on the average from 1934 to 1947, hogs brought in $159 in income for every $100 of feed fed. Regardless of how you rank hogs in efficiency of converting feed crops into food, they offer the farmer a good way to process large amounts of corn into profits.

Hogs don't give quite as high a return for each $100 of feed fed as poultry or dairy cattle where you don't count the labor and capital needed. But one man can sell a lot

Reprinted by permission from the Hog Breeder,
Chicago, Illinois, August, 1950

more feed during the year through hogs than through the poultry or dairy cows he can handle.

That is, it doesn't take nearly as much labor to sell a thousand bushels of corn through hogs, as through poultry or dairy cows. Thus, hogs give you the chance to: (1) get a good income from each $100 of feed fed; and (2) have a large sale volume of business per man. And these are two essentials for making money from farming.

Generally speaking, hog raising doesn't require anything out of the ordinary in management ability.

No special buying or selling skills are needed in marketing either. There's small variation in quality and no specialized market is needed. However, superior management applied to hog production will pay off unusually well.

The hog program is easy to adjust to the labor supply available. Some farmers with special skills, good equipment and plenty of labor may want to produce early spring pigs to take advantage of the higher prices of late summer markets.

This program takes more labor per litter. But it normally gives higher returns also to the skilled operator.

Pigs farrowed in May or early June will take less labor per litter. That allows the farmer to boost the size of his business. Or, he might use less total labor. But if not well organized, the farmer may not do a good job of looking after both his crops and the little pigs at the same time.

Hogs give you a good chance to inject flexibility into your livestock program. It's easy for you to adjust your pork production to your available feed supply and expected future prices. Here's a good example: Many farmers boosted the number of pigs farrowed during the spring of 1949. This boost reflects the larger corn crop produced in 1948.

Hogs also fit in well with other types of livestock. They work in especially well with roughage-consuming livestock. Most farmers need to raise some legumes and grasses to maintain corn yields. That means roughage is available on most farms.

Hogs eat mostly grain. But sheep, dairy cows, beef cows or steers can be used to eat the roughage. The result—a diversified livestock program.

This diversified livestock program tends to spread your risk.

Hogs and Dairy. Dairy cows use lots of pasture and hay but they don't require any fixed amount of grain and their total grain needs are not large. Hogs usually pay well for the corn and some small grain and do not compete with cows for much pasture.

Since milking cows takes a lot of labor right through the crop season, the hog farrowing is usu-

ally planned to come at a time when crops do not require lots of labor. Hogs help the dairyman to get a large volume of business by converting grain into animal products with only a small amount of labor and buildings compared to the dairy enterprise.

Hogs and Beef Feeding. Beef feeding uses more grain and less hay and pasture than the dairy herd. This means that feeder cattle and hogs compete more for grain. If the farmer leans a good way towards hogs, there may be a surplus of roughage. The hog and cattle feeder often finds it to his advantage to buy more grain or else select a cattle program that will utilize more roughage.

The hog-cattle feeding farm can easily have a large volume of business. But it takes a lot of operating capital. The labor requirements are not high. So output per man can be large.

Hogs are valuable in this program because they tend to balance the risks—since cattle feeding is not always profitable. Hogs following cattle on feed utilize feed that would otherwise be wasted.

Big Pasture Farms. On farms where there is lots of pasture there must be roughage-consuming types of livestock. If only beef cows, dairy cows or sheep are used it is difficult to develop a large-volume business.

A dairy herd alone seldom fits well because of the large labor requirement. Some grain is nearly always available and the farmer is likely to find it profitable to use a good deal of it with hogs to step up volume.

If little or no grain is available some may wish to raise pigs for sale as feeders. More often, it pays to buy additional grain to fatten them out.

Most Iowa farmers find it profitable to utilize at least part of their labor and management in hog production. Some highly skilled hog producers prefer to specialize in hogs. They believe that they get a higher return for their labor and management spent in hog production than from other classes of livestock.

Your greatest single risk in hog raising is disease. But it can be held down. Sanitation plus good management will help control disease— or at least reduce risk to a low level.

Another risk is prices. The risk here is not as great as in cattle feeding, however. Normally hogs will at least pay for the feed they eat. The hog-corn ratio is the best measure of the profits of producing pork.

There is a rather defined seasonal trend in hog prices. The skilled producer can often take advantage of these trends to boost his profits. Outlook information is a valuable guide in hog production.

Many farmers have proven that

you don't need elaborate equipment to make money raising hogs. Good equipment may make it easier. But it does not assure you success.

You may need more planning and ingenuity to provide adequate shelter to the pigs with a minimum capital outlay. But we have lots of farmers who prove every year it can be done.

Capital requirements for hog production are low in view of returns expected. You can get a good profit from a relatively small investment.

Thus, hogs offer splendid opportunities to the beginning farmer. He usually is low on operating capital.

About 75 to 80 per cent of the cost of producing a hog is feed. And you can raise most of this on your own farm.

As soon as your corn crop is produced you can step up your hog volume quickly, without investing a lot of cash.

Hogs have another advantage. The rate of turnover of capital is rather rapid as compared to other types of livestock.

Sanitation. Raising hogs on clean ground, scrubbing out the houses and washing the sow's udder all help to control disease and parasites. Using clean legume pasture will pay from the standpoint of sanitation alone.

Care at Farrowing Time. The extra pig or two saved by special care at farrowing time might double the profit from that litter. Pig brooders, guard rails and personal attention help save pigs.

Balance rations are essential for fast and cheap gains. Pigs up to 125 pounds need more protein in the ration than afterwards.

Marketing. Profit can often be increased by taking advantage of seasonal market trends. Marketing weights should also take advantage of seasonal trends.

Quality. It is easy to obtain quality breeding stock for hog production. Select for large, fast gaining, thrifty litters. A good boar is a well paying investment.

Plan the hog program on your farm to fit your management ability and labor supply. Also fit it into the rest of the farm plan. Plan the program far enough ahead so that things are done right and at the right time.

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—*Glenn Frank*

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